INDIAN FOOD INDUSTRY

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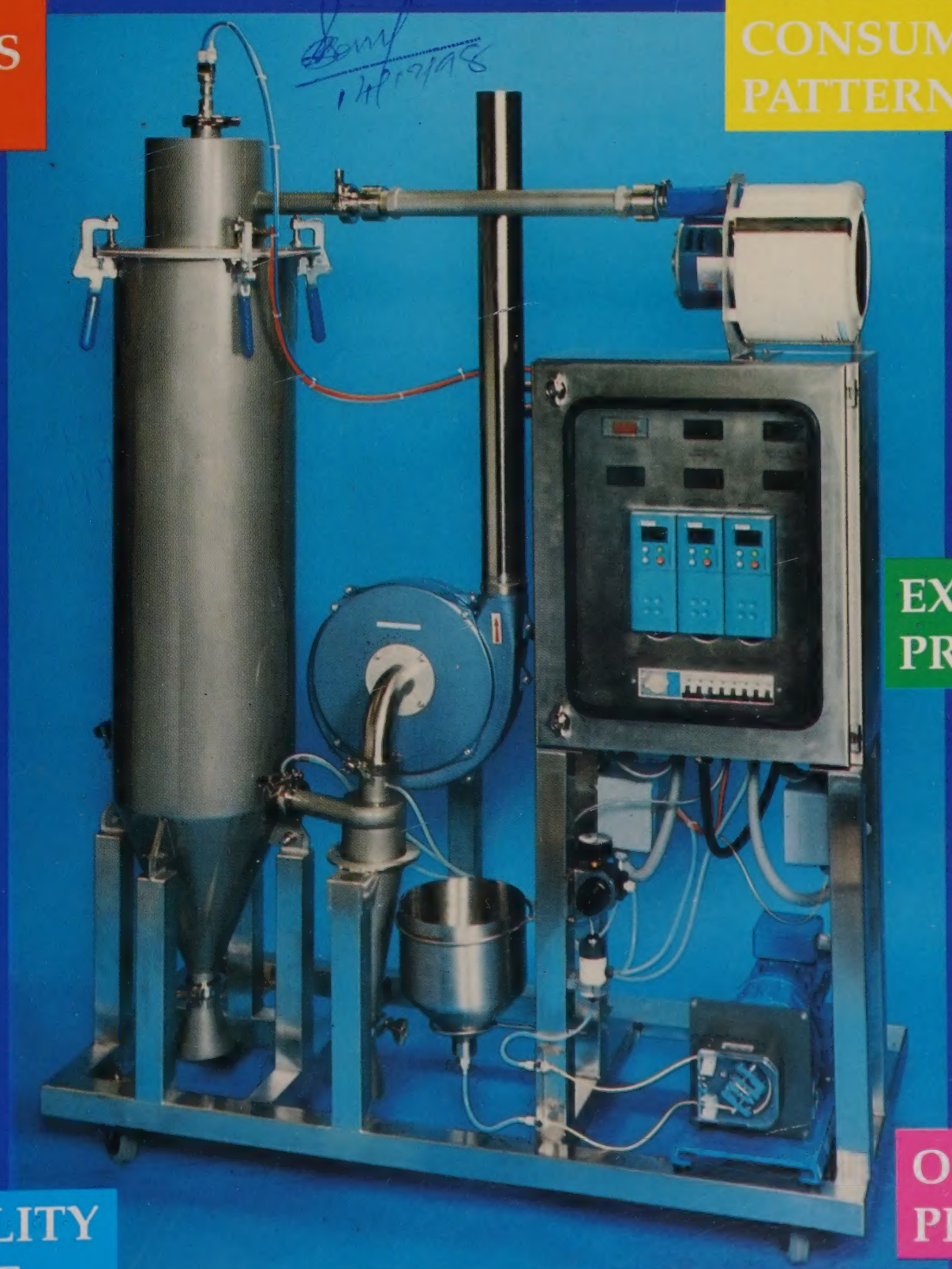
A PUBLICATION OF ASSOCIATION OF FOOD SCIENTISTS AND TECHNOLOGISTS (INDIA)

VIEWS -
FAT INTAKES
IN INDIA

PROCESSED FOODS
CONSUMPTION
PATTERN



EXTRUSION
PROCESSING

FOOD QUALITY
ASSURANCE

OILSEEDS
PROCESSING

ASSOCIATION OF FOOD SCIENTISTS AND TECHNOLOGISTS (INDIA), MYSORE - 570 013

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- Affiliated to the Institute of Food Technologists, Chicago, Illinois, U.S.A.
- The Association is a professional and educational organization of Food Scientists and Technologists, with its headquarters at Mysore.
- The Chapters of the Association are located at Bangalore, Bhopal, Calcutta, Chennai. Delhi, Hisar, Hyderabad, Jabalpur, Jaipur, Jammu, Kanpur, Karnal, Kharagpur, Ludhiana, Manipur, Mumbai, Nagpur, Pantnagar, Parbhani, Pune, Thrissur, and Thiruvananthapuram,

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- Advancement of all the aspects of Science and Technology relating to Production, Processing and distribution of food, with the ultimate objective to serve humanity through better food.
- Promotion of research, development and training in the Science, Technology and Engineering of Food.
- To provide a forum for exchange, discussion and dissemination of knowledge and current developments, especially among Food Scientists and Technologists as well as the Public and Society at large.

Major activities:

- Publication of 'Journal of Food Science and Technology' (bi-monthly) and 'Indian Food Industry' (bi-monthly).
- Holding symposia/conventions on different aspects of Food Science, Technology and Engineering.
- Arranging Lectures and Seminars for the benefit of Members and the Public.

Membership:

- Membership is open to graduates and diploma holders in Food Science, Technology and Engineering as well as to those engaged in these professional activities.
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An unique bi-monthly journal, published by the

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This is an information package journal enlightening the readers with the latest developments in food industry.

Each issue carries carefully selected and edited Feature Articles, Food Industry Reviews/News and Regular features on New Food Machinery, New Products and Processes; Statistical Data, Personalia, Research Round up, Tradefairs, Seminars, Symposia organized throughout the world, Books, Prizes and Awards. Activities of chapters located at various places of India are also published. It is also proposed to publish periodically letters received from the readers whose opinions are highly respected. A new column entitled VIEWS, which permits eminent scientists, academicians and policy makers to freely air their VIEWS on matters of prime importance to the Indian Food Industry, has been recently introduced. The journal is edited by a team of devoted scientists who are themselves experts in their respective areas of specialization.

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VOLUME 17 NUMBER 5

An unique miniature spray dryer

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Indian Food Industry (ISSN-0253-5025) is a bi-monthly publication of the **Association of Food Scientists and Technologists (India),** devoted to give extensive coverage to technological and market development relevant to food industries in India.

Review articles, technology papers based on R&D work and reports on various aspects concerning food industry are welcome from food scientists and technologists from industry, research institutions and other related organisations. Contributors are advised to provide good quality illustrations in the form of charts and photographs along with the manuscripts. The Editorial Board reserves the right to edit the manuscripts in order to make them suitable for publication in the journal, while assuming no responsibility for the statements and opinions expressed by the contributors, nor will they bind AFST (1) in any way. Readers are free to air their views through letters which may be published in the journal from time to time.

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CONTENTS

SEPTEMBER - OCTOBER 1998

FROM
THE CHIEF EDITOR'S DESK

They do not hang persons at the junction of the four roads any more, so laments the celebrated novelist Daphne Du Maurrier in her famous novel "My Cousin Rachel" to give a foretaste of the events she spins around the crime that does not meet with justice and punishment in human hands. I have often felt akin with her on these sentiments. Capital punishment is uncivilized, even barbarous and is not a deterrent is an argument I tend to agree with, but feel frustrated seeing criminals around, who not only go unpunished but also are often glorified in society. A murder has to be committed with a weapon or by any violent method and should be obvious. As a child, my concept of a thief or a criminal was a person with a huge moustache, blood shot eyes complete with a chopping knife in hand. But, now I know criminals prowl with sweet smiles and respectability. Murders can be committed with less obvious and indirect methods. The motives for murder can be varied, but worst of its kind is for material gains. In the movie "Black widow", the sinister lady marries several men, only to dispose them off one by one by ingenious, less obvious methods in order to harvest her spouse's insurance booty. In one instance, she mixes penicillin with tooth paste with the prior knowledge that the man is violently allergic to the antibiotic.

Recently, we witnessed that adulteration of mustard oil caused several deaths in North India. In this case, the manufacturer perhaps did not aim at murder as a means for profiteering, but surely his sole motive was profitteering and by adopting a means which is criminal. It is so vexful that food adulteration is so widespread. There is not a single food item that is not adulterated these days. Adulteration of milk, dhal and such items is done with hazardous ingredients. Although this criminal activity is found only in perhaps a very small proportion among the Indian Food Industries, the magnitude of damage is tremendous. How does one deal with these crimes against society? There could be no single solution. When the crime is proven, ruthless and severe punishment may be just one approach. Active consumer movement could be another. But the true solution would come, when the greedy manufacturer realises that it is awfully stupid to kill the goose that lays the golden egg.

Richard Joseph

INDUSTRY NEWS

Centre Planning to Set up Food Park in Mysore

A food park will come up in Mysore, under the Union Government's proposal to set up such parks in six States, Mr. Ashok Parthasarathy, Union Food Processing Secretary said in Bangalore, while participating in a seminar on "Agri business: emerging challenges and strategies for the next millennium," organised by the Federation of Indian Chambers of Commerce and Industry (FICCI). He said that the State Government-owned Karnataka Agro Industries Corporation (KAIC) would buy 20 acres of land to develop the park. Around 40 medium sized units would be set up at the park.

Mr. Parthasarathy assured that the Union Ministry would take up a techno-economic feasibility study of the KAIC's proto type of a mobile food processing unit and a grant to go ahead with the programme.

Karnataka's Agriculture Minister, Mr. C. Byre Gowda, said that the State was coming out with a comprehensive policy on agriculture soon. He said that the land for the park would be granted and also financial assistance.

He said that the incentives for the agriculture sector was not adequate. It was considering revising concessions as the growth centres for food processing in Hassan, Dharwad and Raichur were not able to attract investments. There was a proposal to set up two more growth centres with more attractions near Bangalore and Bagalkot.

TN Stands Second in Food Production

Tamil Nadu has achieved the second position in the country in food production, according to the State agriculture minister Veerapandi S. Arumugham. Participating in a farmers' day celebration at Palayamkottai in Tirunelveli, he said that the State had surpassed its paddy production target of 70 lakh tonnes, by realising 73.56 lakh tonnes in 1997-98. The acreage covered was 23.5 lakh hectares during the period. Legislators and farmers associations' representatives urged the government to increase the paddy price.

The minister also inaugurated 20 new information centres of the Danish aid agency, Danida, in Tirunelveli and Tuticorin districts. Speaking on the occasion, he said that a comprehensive watershed development project was being implemented with Danida's assistance in 13,350 hectares in Ramanathapuram and Virudhunagar districts at a cost of Rs. 13.3 crores.

ITA Worried Over Duty on Packaged Tea

The Indian Tea Association (ITA) has expressed serious concern over the continuation of Central excise duty of eight per cent on branded tea of over 100 grams. ITA chairman Vinay Goenka said in a statement that though other branded food products as ghee, edible oil, butter and spices had been exempted from the levy, tea was the only item left out.

Tea he said, was a common man's drink and packaged tea was widely consumed among the low income groups. The association felt that the concession granted to packets up to 100 grams be extended to the packet tea segment as a whole.

Vegetable Oil Industry Seeks Variable Import Duty

The vegetable oil industry has reiterated the need for implementation of a variable import duty on edible oils to maintain a healthy price trend in the domestic market.

The chief advisor for the Central Organisation for Oil, Industry and Trade (Cooit), said that the need for variable import duty is necessary to keep the domestic prices in tune with the international trend rather than imposing four per cent special duty of customs that would result in higher domestic prices.

In today's scenario, domestic edible prices are following the international trends and there is little scope for the local factors to have influence on the prices. It is perhaps the right time for the government to introduce the variable import duty as and when the demand supply ratio changes.

The current oil year beginning November 1997 had shown a considerable decline of 30 per cent in India's import of vegetable oils, following high international prices that prevailed till May 1998. During the previous oil year, the shortfall of

vegetable oils stood at 17 lakh tonnes compared to the current oil year's shortfall of 13 lakh tonnes, while the local prices appreciated by over 20 per cent. Mr. Goenka attributed the decrease in import levels to fall in edible consumption levels.

Refined palmolein constitutes approximately 75 per cent of the total vegetable oil imports into the country.

India is estimated to have imported over five lakh tonnes of refined palmolein in the current oil year between November 1997- May 1998, and further 7-8 lakh tonnes are expected to arrive before the end of the current oil year in November 1998.

Government to Import 1.5 lakh Tonnes Edible Oil

The Government would import 1.5 lakh tonnes of edible oil to meet the expected demand during the forthcoming festival season. The imported palm oil, mainly from Indonesia and Malaysia will be supplied to the consumers through fair price shops.

This was stated by the Prime Minister at the party's parliamentary part meeting.

Members expressed concern over the spiralling prices of essential commodities including vegetables, fruits and edible oil.

Responding to their concern, Finance Minister Yashwant Sinha informed them that the import duty of edible oil has been reduced by ten per cent i.e., from 25 to 15 per cent.

Moreover, its import has been brought under Open General Licence (OGL) so that traders could import oil without any hindrance. He hoped that these measures would help control price line.

Describing the present rise in essential commodities as "seasonal" Mr. Sinha advanced three reasons for this price rise. One was deficit financing, money supply and administrative prices.

Later briefing newspersons, Parliamentary affairs minister Madan Lal Khurana said that the finance minister had pointed out that vegetables, fruits and edible oil alone account for 86 per cent of the price rise in essential commodities. Therefore, edible oil was being imported. In 1996-97, oil worth 1.49 lakh tonnes was imported. Last year it was 0.89 lakh tonnes.

As regards potatoes and onions, the government would supply these items through NAFED at subsidised rates in super bazar and mobile vans.

Coconut Oil Prices Slide on Smuggled Inflows

After cardamom, it is now the turn of coconut oil to be smuggled into the country through Nepal via Calcutta. Industry sources have alleged that large-scale of smuggling of coconut oil is taking place in the country.

Industry sources say that earlier almost 30,000 to 35,000 tonnes of coconut oil were despatched every year from Kochi and other producing centres to West Bengal and its neighbouring areas.

However, this has now plummeted to just around 1,000 tonnes.

This gradual decline in dispatches from Kochi and other centres is because of smuggling of coconut oil into the country. At a time when prices have declined, the smuggling has emerged as a major cause for concern, sources add.

Another reason for the decline in the despatch of coconut oil from Kochi is the large-scale use of copra from the Andamans to produce oil in West Bengal.

Though a correct estimate of the copra production in the Andamans is not available, sources are of the opinion that a large part of this is being sent to West Bengal.

India on Cruise to Become World's Biggest Milk Producer

With the largest bovine population, India is set to become the world's largest milk producer, surpassing even the US by the turn of the century.

The country is also likely to be a major player in the global dairy market, thanks to its relatively low cost of production, even though it has one of the lowest yields per milch animal.

Claiming that big things are in store for the sector, Indian Dairy Association President Animesh Banerjee said that India at present produces 70 million tonnes of milk annually, accounting for 15 per cent of the global total of 460 million tonnes.

In 1996, the US was the largest producer, with an annual milk production of 74 million tonnes, followed by India with 68 million tonnes.

With the present growth rate of 5.5 per cent per annum, India is expected to produce 220 to 250 million tonnes of milk by the year 2020, which would be more than one-third of the projected global production of 620 to 650 million tonnes.

The dairy business in India is currently estimated at Rs. 800 billion ($ 19 billion).

A large bovine population, strong procurement infrastructure, presence of highly skilled manpower, cheaper labour and a large number of processing and allied facilities are some of the advantages the Indian dairy business has. Besides, the Indian dairy sector is closely knitted with agriculture and can be considered to be its sub-systems.

Agricultural waste is commonly used as fodder for cattle in the country. Furthermore, milk production in India is far more economical than in other developed countries.

Considering that the dairy market in the developed countries had reached a saturation point and emerging milk markets were expected to be Asian and African countries, India had yet another advantage.

India's livestock population of 272 million constitutes 19 per cent of the world's 1,420 million. More than half of the world's buffaloes are in India and they make for 55 per cent of India's milk production.

By the year 2020, according to Banerjee, India would account for 332 million of a total of 1,471 million of global bovine population. Ninety-four million of the world's projected 151 million buffaloes would be in India.

Over the years, India has established a vast milk procurement and distribution system. India at present has 90,000 village co-operative societies, 170 district unions and 23 state federations.

With nine dairy science colleges, 31 veterinary colleges and as many as 80 agricultural research institutes, India has a large number of professionals working in the industry.

The Indian dairy industry, according to Banerjee, should prioritise branded product export instead of going in for occasional exports and this requires a vigorous campaign in the international market.

Indian sweetmeats and desserts, produced hygienically, can also be one of the thrust areas for export of milk products.

Kurien Favours Higher Duties on Milk, Oilseeds

The National Cooperative Dairy Federation of India (NCDFI) Chairman, Dr. Verghese Kurien has emphasised the need to promote milk and oilseeds production.

Speaking at 28th annual general meeting of the NCDFI, held at Anand, Dr. Kurien said that the country cannot claim to have attained real growth merely by setting up new car factories or welcoming multinational companies to cater to our middle-class. Our economy has not been able to achieve targeted growth mainly due to shortfall in agricultural production, he said and added that Agriculture contributes about 28 per cent of GDP but is not receiving the kind of positive support it should get.

The people in villages measure the success of economic liberalisation not by the availability of consumer goods but in terms of the basic necessities of life, improved food, clothing and shelter, apart from the performance of the institutions that serve them, Dr. Kurien said adding that Parliament should 'immediately' enact a new Multi-State Cooperative Societies Act.

He also called for a renegotiation of India's base rate customs duty for the import of all dairy commodities to 60 per cent, with final bound rate of 40 per cent in 2004-05. He also sought full roll-back of the recently imposed eight per cent excise duty on branded milk products and milk powders, raise import duty on edible oils to 40-50 per cent and exempt agriculture co-operatives from income tax and other commercial taxes.

Godrej-GE to Make Foray Into Water Purification Sector

Godrej-GE Appliances plans to enter into the water purification system segment in India. The company is in the process of identifying the right kind of technology that would suit the Indian conditions. It is likely to choose either the ozonisation process or resin process which purifies water up to one micron level.

According to the company, the present water purification system market in the country is using the ultra violet (UV) process. Godrej-GE had recently introduced washing machines with design agreement of Toshiba of Japan. It has set up a Rs. 80 crore fully integrated factory at Pune where every part of the washing machine is produced.

The company, which has an installed capacity of three lakh washing machines per annum, is also planning to tap the markets in the SAARC countries, especially Sri Lanka, Bangladesh and also Africa and West Asia.

Food Industry Still in the Processing Stage

India today is world's largest producer of fruits and vegetables, yet its share in the Rs. 28,000 crore global trade in processed food is no more than one per cent as about 40 per cent of its produce worth Rs. 23,000 crores is wasted away every year.

Only modern technology, quick transport and better storage facility can enable the industry to grow to its full potential with an annual production of more than 40 million tonnes of fruits and 65 million tonnes of vegetables, experts say.

Only 1.3 per cent of the total fruits and vegetables produced in the country are processed as against 40 per cent for some developing countries and 70 per cent in developed countries.

Though food processing industry has attracted Rs. 61,427 crores as private investment in the first five years of reforms, the industry has failed to register the desired level of growth due to various shortcomings, said Ms. Gauri Sundaram of the Agriculture and Processed Food Export Development Authority (APEDA).

In India, 40 per cent of the horticulture products go waste due to lack of quick transport system.

Most of the food processing plants are in the small and medium sectors with traditional equipment. One of the major disadvantages of this industry is the lack of investment in research and development.

The processed food industry in India has not yet been organised on modern scientific lines with integration from the production of raw materials to the marketing stage. Methods of production are by and large conventional and this affects the efficiency of production.

According to a group study sponsored by the ministry of food processing, most of these units work only during the flush season of fruits and vegetables and close down thereafter.

There is lack of co-ordination between processors and farmers who supply the raw materials. The farmers provide it to the processors only in the absence of a domestic market, said Ajay Kapoor who owns a processing unit in Himachal Pradesh.

Much has to be done in the field of coordination between the producers of raw-materials and processors. In the case of sugar industry, the continuous interaction between the producers of raw-materials and the processors had led to a spectacular growth which is unfortunately absent in case of food processing industry.

The food processing industry also lacks the powerful force of lobbying. Excise duty on tea and spice was removed only because of lobbying.

Most of the processors agree that lack of post harvest infrastructure also acts as a hurdle on the path of growth of this industry. There is a need to develop the cold chain structure which should include pre-cooling, cold storage and refrigerator trucks.

Murugappa Group Identifies New Thrust Areas

The Rs. 2,600 crore Murugappa group has identified six business fields where it plans to focus its activities. The group will vigorously pursue the bonded abrasives, sugar, financial services, ceramic and sanitary ware, confectionery and chains business.

The new focus areas have been identified by the company based on a study conducted by international consultants McKinsey & Company. McKinsey has recommended that the group as a whole should shift its orientation to 'value creation'.

The group has identified bonded abrasives, chains, cycles and confectionery as areas offering high export potential.

As part of its plans to consolidate business operations, the group proposes to undertake mergers of some of the 19 strategic business units.

Rise in Marine Exports

Export of country's marine products during 1997-98 was to the tune of US$ 1.3 billion, for the fourth consecutive year.

Nearly four lakh metric tonnes of sea food was exported to USA, Japan, European Union countries, West Asia and other countries.

The Marine Products Export Development Authority (MPEDA)

sources told that about 1,01,318 tonnes of shrimps valued at Rs. 3,150.56 crores were exported.

The export of marine food products had improved during 1997-98 by two per cent in quantity and by 14 per cent in value, when compared to the previous year (1996-97) sources added.

Sources said Porbandar and Kandla ports in Gujarat had handled the largest shipment of sea food products of 1,25,561 tonnes valued at Rs. 636.15 crores, while Kochi and Thiruvananthapuram shipped 89,365 tonnes valued at Rs. 948.03 crores, followed by Mumbai which handled a consignment of 78,957 tonnes valued at Rs. 636.15 crores.

In Andhra Pradesh, the Visakhapatnam port shipped 23,314 tonnes valued at Rs. 774.96 crores. The Visakhapatnam consignment contained more quantity of aqua cultured shrimps, the sources added. In 1996-97 the major market for Indian sea food was South-east Asian countries. Japan alone contributed 46 per cent of the total 50 per cent of the sea food exported to these countries. India was the largest exporter of sea food to Japan overtaking Thailand and Indonesia.

There was an increase in export of fish items mainly to the South-east Asian market. In 1996-97, about 1,74,519 tonnes of fish were exported, whereas the export of fish was to the tune of 1,88,029 tonnes during 1997-98, an increase of 7.7 per cent. There was four per cent decline in the export of shrimps during 1997-98 as compared to 1996-97 due to shortfall in the aquaculture production.

European Union Lifts Ban on African Fresh Fish

The European Union's execeutive commission lifted a ban on imports of fresh fish from Uganda, Kenya, Tanzania and Mozambique after receiving guarantees that the fish isn't infected with cholera. But it urged these countries to monitor the health of workers handling fish for human consumption. The EU executive body imposed the ban last December following an outbreak of cholera in the four countries.

In a separate decision, the Commission banned imports of fish and other seafood from around 50 countries and territories, saying that they provide inadequate information on hygiene standards. Kenya and Mozambique were among a group of countries exempted from the ban but told to provide more information about hygiene standards by January 31, 1999.

Bumper Paddy Harvest May Boost Agri Economy

A bumper harvest of pady may pack the much-needed punch into a sluggish agri economy. Rice production is expected to reach an unprecedented 100 million tonnes in 1997-98, Minister of state for agriculture Som Pakl said. This is way-above the estimated 83.5 million tonnes (mt) which in itself would be a record paddy crop.

Such a record increase is cause for cheer, given that the negative growth figures for agriculture brought down the gross domestic product (GDP) of the economy to 5 per cent in 1997-98. The growth of agriculture and allied sectors for 1997-98 fell to -2.0 per cent and the decline in production and slower growth of agriculture were attributed to deficient rainfall in the central parts of the country and later heavy winter rain, delaying the rabi sowing process.

The Minister said that rice had recorded a bumper harvest for the second year and though final calculations were still under way, it was likely to be over 100 mt. Nursery raising and transplanting of paddy for the current kharif season too have begun in time in Andhra Pradesh, Karnataka and Tamil Nadu, so a good monsoon could bring with it the promise of another good paddy crop.

The economic survey for 1997-98 had predicted a 2.73 per cent growth for rice, pegging production for 1997-98 at 83.5 mt, possibly the only increase for the year. All other foodgrains -- wheat, cereals and pulses have recorded decline in production and wheat, primarily due to inclement weather resulting in late sowing, will effect the total decline in foodgrain production over last year's record 198 mt. This year's projected foodgrain production of 200 mt was scaled down to 194.1 mt in the survey.

Rice production was 81.3 mt in 1997-98, and was low at 77 mt in 1995-96, which was a low foodgrain production year at 180.4 mt. The country also had a comfortable buffer stock position as of April 1 – 13 mt against the 10.8 mt buffer norm.

A pick up in agriculture in

1998-99 will help boost the GDP growth. According to former RBI governor Rangarajan, if agriculture does reasonably well, then the economy may well record a GDP growth of 6 per cent in 1998-99.

Senior economists reckon that if industry grows by 6 per cent to 7 per cent and agriculture by about 3 per cent, then there could be an overall GDP growth of 6 per cent.

Pest Control Can Boost World Cocoa Crop by 40 Percent

Experts meeting in Ivory Coast are looking at ways to boost cocoa crops through eradicating pests and diseases, which will allow farmers to halt 'slash and burn' farming that has destroyed rain forests.

The virtual disappearance of the forest no longer allows extensive culture. Mastering control of the diseases and harmful insects is of pri-mordial importance, according to Ivory Coast, the world's biggest cocoa producer.

Delegates from 15 producer countries attended the second international seminar on Cocoa Pests and Diseases of Cocoa for mainly technical talks. Asian producers had not sent delegates.

Five major diseases may kill as much as 40 per cent of annual crops, according a report by Europe's chocolate industry group CAOBISCO made available at the seminar.

The threat comes from a host of capsid and mirid insects, fungae, blights and cocoa pod rots. Black pod disease (*Phytopthera palmivora*) hits Africa and other areas and accounts for 44 per cent of losses caused by the five diseases. Crop analysts fear a strong strain, *Phtopthera megakarya*, could one day hit Ivory Coast.

The fungai disease Witches' Broom (*Crinipellis perniciosa*) has already slashed crops in Brazil, a key producer, by one third to 230,000 tonnes in 1995-96 from 353,000 tonnes in 1980-81. It causes 21 per cent of overall crop losses.

Ghana, Nigeria and Togo have been hit to varying degrees by cocoa swollen shoot virus, which one delegate to the conference described as the "AIDS of cocoa". Swathes of farms have been cut down in Ghana to prevent its spread. It accounts for 11 per cent of losses from the five main killers.

Vascular Streak Dieback, a tree disease hitting Indonesia, Malaysia and Papua New Guinea, causes nine per cent of losses. Frosty Pod Rot (*Monilia opthorarorerі*) causes five per cent of global losses. It has hardy spores and is spreading from Ecuador, Colombia and Central America, turning cocoa pods turgid and grey.

TAFE Farm Launches New Rice Strain

The 'J' Farm at Pudupakkam near Chennai belonging to the Rs. 1,200 crore Tractors and Farm Equipment Ltd (TAFE), flagship of Amalgamations group, has launched a new high yielding rice variety, 'super Ponni' called J18 after 15 years of continuous research under organic farming conditions.

The new variety has been developed from a pure fine variety brought into the country from Manila. It has a duration of six months, grown organically and not susceptible to any of the major pests and diseases that affect other paddy varieties.

It assured a minimum yield of 1.5 tonne per acre. The cost of cultivation per acre works out to Rs. 4,000 and the farmers could hope to reap a net profit of Rs. 9,000.

While Tamil Nadu is preparing itself for a second green revolution, it plans to encourage mechanisation in the farm sector without affecting the large number of farmers depending on it.

Mr. A. Sivasailam, Chairman and Managing Director of TAFE said that the two objectives of the company are to supply quality tractors and other farm tools to farmers and help them to get maximum benefit out of these facilities.

He said that the company would soon introduce sugarcane cutters and cotton pickers. In order to protect the environment and the crops, there is a case for encouraging the application of better farm management practices and bio-fertilisers and bio-pesticides.

MPs' Panel Recommends Removal of 8% Duty on Processed Foods

A 10-year tax free zone for the North-Eastern states, repeal of the Cold Storage Order, increase in import duty of lactose, and withdrawal of the eight per cent excise duty on processed foods are some of the key recommendations of the Parliamentary Standing Committee on Agriculture's report on the ministry of food processing industry.

The report highlights the committee's disappointment at the min-

istry seeking an outlay of Rs.128 crores for 1997-98 of which they got only Rs. 60 crores. Budgetary plan allocations should be increased at least to Rs. 200 crores at the revised estimates for 1997-98, it said.

The report had also sought an action plan for Modern Foods and approval of the CCEA of the Rs. 76 crore project of the Fisheries Survey of India to acquire six deep sea fishing vessels.

The committee has recommended that for the Ninth Plan, the ministry should come out with an effective package of varied programmes which could be implemented on a much larger scale and pose it for funding to the Planning Commission, so as to enable them to receive at least an allocation of Rs. 2,000 crores for the Ninth Plan to achieve definite targets.

The committee has expressed confidence over increasing capital flow to the North-East by providing fiscal incentives to the States. To this end, declaring the area a tax-free of income tax, excise, sales tax, municipal taxes for all food processing industries would boost economic development.

The committee has criticised the decision to impose fresh excise duties on processed foods in the 1997-98 Finance Bill, after all horticultural produce was exempted from Central excise duty since 1991.

The committee felt that all processed fruit and vegetable products should be considered as essential commodities.

The committee has also instructed the FPI ministry to put before the finance ministry for increasing import duty on lactose from 20 per cent to 60 per cent to protect the domestic milk producers and avoid dumping. International price of lactose was quoted at Rs. 34 per kg as against domestic cost of Rs. 62 per kg, owing to heavy subsidisation of lactose production in the US and Europe.

The committee has strongly recommended the repeal of the Cold Storage Order stating that it hinders growth of the sector and impose unnecessary controls.

Spices Board May be Bifurcated ?

Close on the heels of Union commerce minister Ramakrishna Hegde's statement that the commodity boards will be recast, a letter from the ministry to the Spices Board has lent credence to the view that the functions of the Board will be bifurcated.

The move is likely to evoke mixed reactions from Board officials, industry and trade.

Four years after a parliamentary committee recommended the operations of the Spices Board be streamlined, the Board has, once again, become the focus of attention following a commerce ministry letter seeking the list of current assets under cardamom research and development.

The parliamentary committee had in 1994 recommended the Board concentrate on export promotion and that the research and development activities for cardamom should be entrusted with the agriculture ministry. The recent letter from the commerce ministry is seen as a follow up to this recommendation.

The Spices Board is now looking after the development and research of only one commodity, namely cardamom. For all other spices, its mandate is confined to export promotion.

It may be recalled that Mr. Hegde had recently stated that the Acts governing the commodity boards would be amended and more representatives of the trade and industry would be included. He had hinted that new reforms would be introduced to streamline the functioning of the commodity boards.

On the issue of bifurcating the functions of the Spices Board, both the industry representatives and the officials agree that more resources will be set apart for cardamom once the agriculture ministry takes over the development and research aspects of the crop. However, a section of officials at the Board expressed doubts whether the money allocated for this move would be well spent. They pointed out that the production and productivity of cardamom had registered a phenomenal rise after the Spices Board had taken over the functions of cardamom development.

TN Sugar Output Set to Exceed 12 Lakh Tonnes

Tamil Nadu's sugar production for the current season (October '97-September '98) is all set to exceed 12 lakh tonnes as against the earlier estimation of 1 lakh tonnes.

The State has already crossed its last season's sugar output of 10.83 lakh tonnes. It has produced 11.40 lakh tonnes till July 15, 1998 (as against 10 lakh tonnes produced in the same period last season).

However, the industry has recorded a lower sugar recovery rate of 8.41 per cent (8.97 per cent), de-

spite stepping up the cane crushing to 135.61 lakh tonnes (111.53 lakh tonnes).

While private sector mills have marginally increased their production, till July 15, to 6.32 lakh tonnes (6.01 lakh tonnes), the contribution from co-operative sector has jumped to 5.07 lakh tonnes (3.98 lakh tonnes).

According to sources, the total output for the current season is expected to be marginally over 12 lakh tonnes as most of the mills have again started crushing . This is expected to go till the end of the season.

The spill over of the crushing season in TN is mainly due to heavy rain falls during the last quarter of 1997 which delayed the beginning of crushing operations. As a result, the mills have piled up huge stocks.

The percentage of stock to production for TN sugar sector was higher at 81.2 per cent, as compared to the industry average of 72.7 per cent. For other leading sugar producing States like Maharastra and UP, it was only 71.5 per cent and 74.8 per cent respectively.

For TN, sources said, the cane price was steeply hiked during 1997-98 at over 10 per cent, while the levy sugar price was indeed marginally lower than the previous year. The TN industry has also been hit by adverse agro-climatic conditions which has depressed sugar recovery substantially by over one and half per cent this season.

Vegoil Product Order Not Now

The government has decided to put in abeyance the Vegetable Oil Products (Development) Order 1998, aimed at liberalising the edible oil industry, because of the sharp rise in prices and the dip in domestic availability of the commodity.

A notification was expected to be issued earlier by the food ministry for bringing into effect the order known as 'VOP (development Order, 1998', as it had completed all the procedures relating to it.

As the new order is aimed at ensuring rationale growth and doing away with the regime of various control orders in the industry, notifying it now would mean relaxing the rules at a time when prices have scaled unprecedented levels.

The VOP (development) Order is an amalgamation of the relevant provisions of the VOP (Control) Order, 1947 and the VOP (SOQ) Order, 1975, which the government felt had outlived their utility.

Under the new order, the department of sugar and edible oils will supervise the quality at the manufacturing stage, while monitoring at dealer and retailer levels will be left to the provisions of the Prohibition of Food Adulteration (PFA) Act and the relevant health authorities. The Order also provides for the appointment of a 'development commissioner', who would supervise the implementation of various provisions of the VOP(Development) Order, 1998.

The focus of the proposed order would be on simplification, transparency, consumer protection through quality assurance and collection of statistical data necessary for policy planning.

Producers of vegetable oils, under the new order, will have to obtain fresh registration certificates from the concerned development commissioner to begin manufacturing.

Cadbury on Market with 'Picnic'

Cadbury India Ltd, the chocolate major, would be introducing new chocolates and confectioneries in the next 2-3 years in the country, in an obvious attempt to corner more market share in the confectionery segment.

As a first step, the company, had a nationwide launch of 'Picnic'- a brand from its international stable- from Chennai.

The 40 gm chocolate, packed with nuts, wafers, caramel and raisins, is priced at Rs. 14.

Mr. Rajiv Bakshi, Managing Director (designate), Cadbury India, said that the company had invested over Rs. 120 to 130 crores during the last 3-4 years to modernise and add new plants in India.

The products that Cadbury might introduce in the near future include jelly and 'mentos;' like chocolates.

The expansion, funded mainly through internal accruals and a right issue, which fetched Rs.55 crores, is part of the aggressive investment strategy charted out by Cadbury to increase per capita consumption of chocolates in India, besides popularising chocolates across all age groups and positioning it as a 'snack' item.

Mr. Bakshi said that the per capita consumption in India - at 25 gms per person in urban areas - was pretty low compared to about 7-8 kg per person in the United Kingdom.

With a successful 'Perk' launch in 1995, Cadbury has introduced 'Picnic' in an attempt to make deeper inroads in the snacks category.

The Rs. 375 crores chocolate major, could no longer afford to re-

main complacment, with chewing gum and value-added toffee manufacturers recording an explosive growth.

Even though economic sluggishness cut across all segments of the industry, the chocolate market almost doubled in the last two years.

According to him, with launch of KitKat (a Nestle chocolate) and Perk, the market initially blew up by over 45 per cent. However, in the longer run, it stabilised to about 15 per cent.

Whie KitKat has a share of 11-13 per cent, Perk has managed to corner almost 8-10 per cent in the last 2 years.

Indian Soybean Traders to Spread Roots in Japan

Indian soymeal exporters are turning away from troubled South East Asian markets and are targeting Japan as a destination.

"We are hopeful of becoming the largest supplier of soymeal to Japan," said Prem Agarwal, Secretary of the Soybean Processor Association of India (SOPA).

Mr. Agarwal said that Indian soymeal was being offered at $260 per tonne on C&F (cost and freight) to Japan against $275 per tonne earlier.

"India has better opportunities for soymeal exports to Japan as our prices are very competitive when compared to the United States," he added.

Exporters have watched orders dwindle in recent months from traditional buyers like South Korea, Indonesia and Thailand all reeling under economic turmoil.

Japan imported 771,539 tonnes of soymeal between January and November 1997. Brazil was Japan's biggest supplier followed by the United States and India.

India's soybean production is expected to rise to 5.4 million from about four million tonnes in 1996/97.

Soymeal exports are forecast to reach a record 3 million tonnes this year against 2.4 million tonnes in 1996/97 and 2.6 million tonnes in 1995/96.

Soymeal export prices for January shipment from the west coast of India are currently quoted at $220 per tonne FAS (free alongside ship) compared to $285-276 a year ago. Soybean prices were quoted at Rs. 11,000-11,300 per tonne in central Indian markets, little changed from a year earlier.

Traders said more than 2.3 million tonnes of soybean had reached the markets and 1.8 million tonnes had been crushed. Exporters have clinched orders for some 1.6 million tonnes of soymeal, while more than 1.3 million tonnes have been shipped.

Reckless Use of Ground Water *Vis-a-Vis* Food Output

There has been reckless exploitation of ground water in India and its overuse, without any plans for replenishment, will have a serious effect on food production, a leading environmental research organisation has warned.

The highly respected Worldwatch Institute, in its annual "State of the World" series, said this could be disastrous for a country like India, which ranks third in world grain production after China and the United States and relies on irrigation for most of its food.

The report noted that in every state and city in India, exploitation of below-surface water has been "extensive and reckless with no regard for what is sustainable and without any plans for replenishment."

It warned that the situation was getting worse because groundwater levels continued to decline in much of the country "as some six million pumps lift water for irrigation." The report said the states incurring huge water deficits from overpumping were Gujarat, Haryana, Karnataka, Maharashtra, Punjab and Rajasthan. In Punjab, India's breadbasket, the water table in much of the State is falling roughly two-thirds of a metre per year.

The report also stated that in many countries, water diversion from rivers has "now reached the point where some of them no longer make it to the sea." Citing the example of the Ganges, the report said the river, "providing much of the irrigation water in northeastern India, has little left when it reaches Bangladesh.

This has created problems for the Bangladeshis, who desperately need irrigation water and who are faced with the incursion of sea water as the river's freshwater flow diminishes.

It also noted with alarm the growing rape of forests in developing countries for firewood, which had left many cities and towns completely bereft of trees.

The report said, "Satellite photographs of India show forests receding from virtually every city in

the country." It said a similar phenomenon "exists in many cities in Africa."

The report also bemoaned the air pollution in India, both indoor and outdoor, which it said was responsible for 2.5 million premature deaths a year in the country.

Bangladesh May Waive Irradiation Certificate

Bangladesh will soon waive the requirement of an irradiation certificate -- that checks against radio-activity in fruits, vegetables, cereals and other food items -- until now a pre-requisite on Indian exporters.

Mr. Vinod K. Kaul, Assistant Director of the Agriculture and Processed Food Products Export Development Authority (APEDA), told that the waiver was expected, "any moment" as he had already received telephonic confirmation from the Bangladesh authorities.

Though an irradiation certificate is not mandatory in all countries, Bangladesh had been insisting on it. Till 1995, Indian exporters, complying with the stipulations, had their product certified by the Bhabha Atomic Research Centre (BARC).

However, in 1996, exporters ran into trouble when BARC increased the sample (one kg of an item) testing charges from Rs.500 to Rs.2,000. This meant that exporters had to bear a 300 per cent increase, Mr. Kaul said.

The process was relatively simple for those exporting a single item like rice or wheat as one kg of the item per truck was tested and cleared. Exporters of fruits and vegetables had to shoulder a multi-fold increase as vegetables and fruits were sent in an assortment. This meant that samples of every assorted item per truck needed to be cleared.

Following-up on a representation made by the fruit exporters in September 1996. The APEDA urged BARC to reduce the testing charges but to no avail. BARC pointed out that it had raised the charges after 10 years.

APEDA then made out a case for the fruit exporters and took it up with the Indian embassy in Bangladesh which subsequently pursued it with its counterpart in the country. In 1995-96, the value of APEDA's exports stood at around Rs.8,000 crores with 25 per cent coming from processed foods, 40 per cent from cereals, basmati and non-basmati rice and the remaining from other items.

The Poor Man's Vegetable is Now a Precious Commodity

Scarcity in commodity crops months after a glut is common to Indian agriculture and this time it has happened in the case of onions. A nation-wide shortage has occurred due to the destruction of standing crops by unseasonable rain during the harvesting time in the major growing areas and also due to the reduction in areas by 35 per cent compared to last year leading to a scarcity and skyrocketing of prices.

Onion prices, which were ruling at Rs. 6 to 8 a kg in the retail markets a few weeks ago, are now ruling at Rs. 18 to 25 a kg. This sudden spurt in prices has brought tears to the eyes of not only the consumers, who are forced to pay through their nose, but also the farmers who have lost their crops.

Says a farmer from the Chitardurga district who was in Bangalore to sell his produce "Nearly 90 per cent of the crop has been destroyed this season due to the rains but I am hoping to make good the losses suffered by the 10 per cent crop which I have harvested as prices are ruling high at the moment".

Mr. Adi Murthy, President, Potato and Onion Merchants Association, Bangalore, who is in the business for about 35 years now, says: "I have never in my life seen prices ruling so high."

The arrivals in the Bangalore market have come down considerably from about 1,000 tonnes a day to 300-400 tonnes a day at present, he said. The diversion of the commodity to neighbouring States of Tamil Nadu, Kerala and Andhra Pradesh has also led to shortage in Bangalore. About 80 per cent of the Bangalore requirement is met by Nashik district and the rest from areas such as Dharwad, Gadag, Bijapur, Chitradurga and parts of Shimoga.

Apart from the farmers who have harvested a good crop, commission agents and traders are also having a gala time. As the prices have shot up, the commission of the agents has gone up considerably. At present, a commission of 4 per cent is being charged by the agents from the buyer.

NAFED Suspends Export of Big Onions

Mr. B. M. Sarin, Chairman, National Agricultural Co-operative

Marketing Federation (NAFED) announced, the suspension of the export of big onion from all ports of the country temporarily.

Mr. Sarin informed this at a meeting of the managing committee of National Horticultural Research and Development Foundation represented by the NAFED and associate shippers.

Mr. Sarin said that this decision was taken on the directions of Mr. Chaturana Mishra, Union Agriculture minister.

Mr. Sarin said that the Union minister desired that NAFED should temporarily stop export of big onion till its domestic prices are stabilised at reasonable level, in the interest of the consumers in various parts. The prices of big onion for the last two months have been soaring high owing to the shortfall of khariff crop in Maharashtra which is the largest onion growing state.

UPASI Plans to Enhance Aroma of Nilgiri Tea

Quality bug seems to have bitten the south Indian tea industry, especially the UPASI Tea Research Institute (UTRI). During the Ninth Plan period the UTRI proposes to undertake studies on improving quality of south Indian black teas, specially the Nilgiris sorts and the Tea Board has sanctioned Rs. 0.78 crore for the project.

Improving the aroma profile of 'Nilgiris' tea is high on the agenda and the first step in this direction, commented Dr. N. Muraleedharan, Director, UTRI. This would be followed with research on various aspects of Nilgiris tea especially in relation to quality.

The tea research laboratory, being set up in Nilgiris, is to be commissioned very soon and would be equipped with gas chromatography and atomic absorption spectro-photometer. The installation of these equipment is expected to hasten the analytical service capability in relation to PFA standards (black tea) of the laboratory.

More importantly, Dr. Muraleedharan commented, the aroma profile of teas could be given instantly and this could be of great help to the estates in improving quality. Further, he said that the laboratory would look into various aspects of improving aroma profile.

During the tea manufacturing process, certain amount of aroma escapes into the atomsphere, he said, and the scientists' major task would be to find solutions to this problem. By capturing more aroma, the teas could be made more qualitative in nature and with this, the price profile would also become substantially attractive.

In a year's time, the research laboratory in Nilgiris would be fully equipped to handle pesticide residual analysis. With some select importers very particular on this issue, this service could play an important role in helping estates produce better quality teas. Currently, this facility is available only at Valparai, the headquarters of UTRI.

South Indian Tea Output Maintains Negative Growth

South Indian tea output has recorded negative growth for the second consecutive month during 1998. Tea production during May 1998 dipped to 20.27 million kgs as against 22.56 million kgs recorded the previous corresponding period.

The three tea growing districts in Tamil Nadu namely the Nilgiris, Anamallais and Nilgiris-Wynaad and Kanan Devan in Kerala are very crucial for the southern tea industry, as these four regions account for bulk of the production.

According to sources, the four major southern tea growing districts have been experiencing heavy rains and some of the regions have not seen sunshine for almost two weeks which is really a bad sign.

Tea production statistics for the month of May 1998, reveal that only production in Karnataka has registered a positive growth of 7 per cent. On the contrary, tea output from Tamil Nadu and Kerala have registered a negative growth of 15 per cent and 3 percent, respectively.

While in May 1998, Tamil Nadu crop is estimated at 11.60 million kgs, the Kerala output is pegged at 8.04 million kgs as against 12.47 million kgs and 8.65 million kgs respectively during May 1995.

It may be noted that after recording substantial growth during May 1996, tea output in both Tamil Nadu and Kerala has declined steadily during May 1997 and May 1998.

However, tea output for the first five months of calendar year 1998 remained higher at 80.69 million kgs as against 78.88 million kgs recorded for the January-May 1997 period, a marginal increase of little over two per cent.

VIEWS

Intakes of Fats in India

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(The 'VIEWS' column is intended to permit eminent consultants, academicians and policy makers to air their views on matters of prime importance to the Indian Food Industry. It is hoped that this feature will facilitate to set in motion the process of serious thinking, situation assessment and action planning among the concerned people. It could also serve as a forum for debate where diverse opinions and views are expressed. Towards these ends, the VIEWS column, which as of now will be on invitation, will allow freedom of expression, not necessarily congruent with the journal's views-

Chief Editor)

A common perception is that Indian food is too oily, especially because our popular snacks are mostly fried products. Yet, till about twenty years ago, there have been little hard data on the actual quantities of fat which people in different parts of India consume and the differences in this regard between affluent people and the poorer ones who made up the bulk of the population. Even the Indian Council of Medical Research, which periodically lays down recommendations for the amounts of nutrients which Indians need, could give only rather vague guidelines till a few years ago in respect of fat, which is the general nutritional term that includes both liquid vegetable oils and solid fats like butter and ghee.

Intakes of Fat

Dietary surveys in the last two decades by organisations like the National Nutrition Monitoring Bureau, the National Sample Survey Organisation and the National Council of Applied Economic Research show that the daily average intake of fat varies enormously in different States of India, from 3 g per head per day to 20 g. Punjab, Haryana and Gujarat are high-intake States; low-intake States are Orissa and Kerala, while the other Indian States range in between. These are all really low figures when compared to the 100 to 150 g of fat consumed per day in advanced countries. Of course, it is now recognised that these quantities are much too high, but how do our own smaller fat intakes stand up to nutritional scrutiny ?

In every State in India, the quantity of invisible fat in an average diet is greater than the quantity of visible fat used alongside for cooking.

What was not realised till quite recently is that Indian diets carry an extra load of invisible fat that cannot be seen. Everything that we usually eat, like rice, wheat, milk, spices, groundnuts and has a little bit of fat in it. Rice has 1.7%, wheat 3%, milk 3.5% and fresh coconut as much as 40%. Marrying these figures with dietary intake data, I first showed about twenty years ago that diets in various parts of India contain cumulatively about 15 to 25 g of invisible fat. In every State in India,. the quantity of invisible fat in an average diet is greater than the quantity of visible fat used alongside for cooking. It is abvious that these facts have nutritional significance.

Oils and fats are very dense sources of energy, yielding 9 kcal per gram against just 4 calories from proteins or carbohydrates. In Indian diets, if visible and invisible fats are added up, calculations show that they contribute on average 13.2% to the total energy in the diet. This is a low figure, though it is now agreed that the 30 to 40% proportion in advanced countries is too high.

Various Groups of the Population

Very poor population groups can be expected to be below the national average figure of fat intake which is 13.2 energy %, but by how much ? Again using dietary data, it

turns out that these poor people get just 10% of their total energy intake from fat. This of course is all from invisible fat; the very poor cannot afford to buy any cooking oil at all because it is simply too expensive.

At the other end of the scale are those who constitute the upper income group and they are all city dwellers. In this small but growing upper crust, as much as 30% or more of the total daily energy comes from high intakes both of visible fat (which they can afford to buy) and also of invisible fat (coming from a better diet which includes lots of milk, for example). Thus, our affluent groups have a level of fat intake which resembles that in advanced countries, and like them, need to reduce their consumption of fat.

A curious fact is that simply the fact of living in cities seems to make for greater fat consumption. Even very poor slum dwellers who live in metros average about 13 energy % as fat, which, as we have seen, is almost the all-India average.

Quality of Fat

So far, we have considered the quantity of fat, whether as grams or percentages. There is also a quality dimension. All oils and fats are made up of three classes of fatty acids: saturated fatty acids S, monounsturated or oleic acid O, and polyunsaturated or linoleic acid L, in varying relative proportions. A few oils also have a small percentage of another fatty acid called linolenic.

Invisible fats are also made up of these same fatty acids, namely S, O, L and linolenic. In the kinds of diets that Indians eat, calculations show that S, O and L are present in almost equal proportions or about one-third of each. This seems to be broadly speaking a rather desirable balance, though slightly less of S and more of L is probably even better. It also seems that a very small quantity of linolenic acid, about 3% of the total fat (or one-tenth of the quantity of linoleic acid, L) would be about optimal. Indian diets are generally short of this linolenic acid, which can be provided to the body by consuming green leafy vegetables, or by using some mustard oil in the kitchen, or by eating fish a couple of times a week.

Even very poor slum dwellers who live in metros average about 13 energy % as fat, which, as we have seen, is almost the all-India average.

Indian adults, both male and female, should take about 20 g of oil or fat every day, and older children (who need more energy for growth) need 22 g daily. Pregnant women also need more, 30 g and lactating women still more, 45 g daily.

Recommendations of the ICMR

Considerations of the kind that have been described in this article have been employed by the ICMR to lay down in 1989 its Recommended Daily Allowances (RDA) for fats, among other nutrients. Indian adults, both male and female, should take about 20 g of oil or fat every day and older children (who need more energy for growth) need 22 g daily. Pregnant women also need more, 30g and lactating women still more, 45 g daily.

To ensure an adequtate supply of linoleic acid (L), the ICMR further suggests that the oil used for cooking should contain at least 20% of this fatty acid. Such oils include groundnut, safflower, sunflower, ricebran and so on - indeed the choice is wide.

Other Considerations

Certain other factors are relevant. Much new evidence is emerging from nutritionists regarding the importance for good health of substances called antioxidants. Certain vegetable oils contain good quantities of some of these, in particular sesame (til or gingelli) oil, palm oil and palmolein and rice bran oil. These oils should be chosen where available. Also, to repeat what has been said earlier, a little mustard oil in the kitchen could be advantageous if used in certain dishes.

While the average Indian and the poor, would benefit by using a little more oil, the high cost of oil is a real deterrent. But the affluent groups would do well to cut down not only on the use of oil in the kitchen, but also the temptation to reach for those tasty fried snacks, which carry an awful lot of absorbed oil.

FEATURE ARTICLES

Flowers as a source of natural food colours

Newer Dimensions in the Processing of Oilseeds for Food Uses

Extrusion Processing of Foods and Feeds

Food Quality Assurance : Microbiological Concerns

Consumption of Processed Food Products Among Urban Families

Newer Dimensions in the Processing of Oilseeds for Food Uses

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Introduction

Overpopulation, hunger for more proteins and food calories, improper food distribution, environmental pollution, waste management and depletion of agricultural resources will be the major challenges for the world in the coming years. During the last few decades, efforts have been accelerated to develop new sources of proteins in order to meet the ever increasing requirements of the teeming millions.

There aree enormous amounts of oilseeds available in the world and they contain good quantities of quality proteins. This source of proteins can help significantly in meeting to the protein needs in different parts of the world. Crops such as groundnut, cottonseed, seasame, soybean, sunflower, coconut etc. are grown partly or entirely for oil production. The protein-rich solid material (nomenclatured as "meal" or "cake") which remains after oil extraction has either been used as fertilizer or as animal feed. If the same material is consumed by humans without challenging the proteins through plants and animals, the protein needs of humans can be fulfilled effciently to a remarkable extent (Ashraf Pal,1998). In this context, the terminologies like novel foods, fabricated foods, innovative food products, engineered foods etc, are commonly heard of, wherein efforts have been/are being made to put the meal to judicious use by humans for protein supplementation. These and the other novel products which are being formulated from oilseeds and their by-products can be categorized under the newer dimensions of processing of oilseeds for food uses.

India stands a good position in oilseed production in oilseed production, contribututing about 10 per cent of total world production and thus is capable of producing huge quantities of utilizable by-products from them.

Overpopulation, hunger for more proteins and food calories, improper food distribution, environmental pollution, waste management and depletion of agricultural resources will be the major challenges for the world in the coming years.

The value addition in the oilseed processing industry could be achieved to the maximum extent by taking advantage of certain inherent characteristics posessed by individual seeds. Toxins of many types exist in many varieties of foods and oilseeds is no exception. Tackling the problem becomes more crucial taking the above factors into consideration.

The probable novel foods from different oilseeds may be grouped under the following heads :

1. Oilseed proteins in vegetarian diets; and 2. Oilseed proteins in non-vegetarian diets.

Oilseed Proteins in Vegetarian Diets

Cottonseed

Cottonseed containing 20% protein was first suggested as a source of human food in 1876 for diets requiring a low starch content. But it is rarely used as an edible protein. The major disadvantage is the presence of a toxin called gossypol and its dark green colour. However, advances in breeding glandless cottonseed and latest processing technologies have increased the potential of cottonseed protein for food uses.

Glandless kernels can be directly roasted to get high-protein nut-like product. They can be used for topping on bakery goods and ice cream specialities. Cottonseed flour, partially or fully defatted, produced by mechanical pressing-solvent extraction can be used to impart functional characteristics like dough machinability, controlled spread and improved browning to baked and confectionery products (Spadaro and Gardner, 1979) and as a protein supplement to overcome malnutrition (in combination with corn flour, sorghum flour and other

additives). The cottonseed concentrate can be used to prepare extruded and texturized proteins. The extruded concentrate blended with wheat or rice or corn has excellent expansion characteristics, and is best suited for snack products. Replacement (10-20%) of wheat flour with cotton seed flour gives protein- rich bakery products. They have yellow colour and no off-flavours.

De Buckle *et al.* (1979) found that the cottonseed protein isolate prepared from meal by extraction of protein with a suitable chemical (2% hexametaphosphate solution) followed by precipitation of protein at an optimum pH contains 34% protein and 20% fibre. Yield of isolate was 16% and it had a white-creamy colour with bland flavour.

Seasame

Sesame is the earliest and the oldest crop grown for edible oil. It is called 'Queen of Oilseed Crops' because of high yield of oil and quality of oil. It contains 50% oil and 25% proteins.

Dehulling of seasame for human consumption is important since the hull has a bitter flavour. Dehulled, defatted meal contains 60% proteins and is bland. Sesame proteins contain large quantities of methionine and low quantities of lysine.

Fried sesame seed with sugar is used as soup ingredient. The paste of roasted sesame seed is similar to peanut butter and is used in bakeries. Many delicious sweets are prepared using sesame. Dehulled, pre-pressed, solvent extracted sesame meal has more than 60% proteins. Sesame meal is considered too valuable to be fed to animals. Enrichment with soybean increases the Protein Efficiency Ratio (PER) of all sesame products (Johnson *et al.*, 1979).

Soybean

This golden bean from China is a highly proteinaceous oilseed containing 40% proteins and 20% of oil. The problems of typsin inhibitor and beany flavour are inherent to soybean. However, the high temperatures involved during processing reduce these problems considerably.

Novel products which are being formulated from oilseeds and their by-products can be categorized under the newer dimensions of processing of oilseeds for food uses.

The soy protein concentrate prepared from de-oiled meal contains not less than 70% proteins. The protein isolate contains about 90% proteins. The soyflour prepared from partially or fully defatted cake when added to wheat flour gives more nutritious bakery products.

A speciality product called 'REGO', containing good proportions of soy proteins, carbohydrates, minerals and vitamins has been released in powder from which when reconstituted gives instant energy and is found to be best suited for sports persons. Soy-protein is the major constituent in this product and is launched in the United States. A fat replacer called 2-Trim has been released in the U.S. and it contains hulls of soy, peas and rice or bran from corn or wheat and is fibrous.

A speciality product called 'REGO', containing good proportions of soy proteins, carbohydrates, minerals and vitamins has been released in powder from which when reconstituted gives instant energy and is found to be best suited for sports persons.

Groundnut

It has a bland flavour, minor colour problems and requires minimum preparation. Apart from the known uses of the nut in fresh and roasteed forms, other products like fully and partially defatted flour and defatted grits can be prepared for use in bakery products, breakfast cereal flakes, ice creams, mass feedings etc.

The protein concentrate and isolate contain 60-70% and 90% proteins respectively. The major disadvantage is the presence of aflatoxin which is toxic. The preparation of groundnut proteins from solvent-extracted groundnut meal involves preparation of a water meal mixture and addition of protein-dissolving chemical like caustic soda, clarification of the mixture by means of screening, filtering and centrifuging, precipitation of protein as a cheese-like curd from the water-protein solution and drying the protein curd (spray drying with permitted additives). Groundnut proteins thus prepared have been used in infant food formulations.

A novel process for the production of large-scale peanut flour consists of moistening peanuts to 12%, heating to 82.2° C and holding for 30 min. at the same temperature, to bring down the moisture content to 6% and flaking and removing oil by direct solvent extraction. The product is a white flour, bland and virtually free of raw peanut flavour, with 65% proteins.

Sunflower

Sunflower has around 55% oil and 25% proteins. Sunflower meal is essentially low in lysine, an essential amino acid and energy and hence requires fortification.

Sunflower protein equals soy protein in terms of biological value and is superior to most vegetable proteins in digestibility. The dark colour of the flour and chlorogenic acid in protein products restrict its use for human food. However, Sosulski (1978) found that sunflower proteins can be excellent, if used as milk exdtenders in bakeries.

Safflower

The safflower plant has carthamin pigments which can be used as food additive. Safflower tea developed from petals of safflower plant is exported from China (Prasad, 1994).

Coconut

High protein coconut flour is prepared by shredding the kernel, drying it in continous current drier, solvent extracting the dried meal to recover oil and powdering and grading the extracted meal. It is of snow white colour and contains about 25% proteins which is as good as egg or meat proteins. The oil obtained is much superior than that produced by traditional copra drying. Coconut flour is an excellent raw material for bakeries. India has already entered into making 'tender coconut water concentrate', 'coconut cream', 'frozen tender coconut flesh' and 'coconut powder' which are ready-to-use products.

Coconut water can be used to prepare bio-sweets. These sweets can be made with the help of a bacteium biosynthesising the pure cellulose grown in coconut water. A particular bacterium when grown in coconut water forms a translucent, white gelatinous, thick gummy layer on the surface of the liquid in two weeks time. The jelly layer if washed and candied by boiling in sugar syrup, a bio-*halwa* resembling chocolates can be obtained (Anon.1995).

Castor

Castor meal contains highly potent toxins and has only limited end uses in food.

Rapeseed and Mustard

These contain 45% oil and 22% proteins of very high quality. Due to high contents of lysine, methionine and cysteine, rapeseed proteins have a higher nutritive value than any other known vegetable protein. The nutritive value is comparable to any good animal protein. Indian mustard has very high levels of erucic acid in oil and glucosinolates in its meal and is not accepted in international markets. Research is on to mitigate these problems.

Sunflower protein equals soy protein in terms of biological value and is superior to most vegetable proteins in digestibility.

Vegetable Protein Blends

Plant proteins can be combined so that the amino acids lacking in one plant are supplied by another in the mixture. INCAPARINA is a mixture made from cottonseed, corn and soy proteins. This and several other products have been recommended by the Protein Advisory Group of United Nations for feeding of children, expectant and nursing mothers and other adults in the developing countries.

India has already entered into making 'tender coconut water concentrate', 'coconut cream', 'frozen tender coconut flesh' and 'coconut powder' which are ready-to-use products.

Fermented Products from Oilseeds

Fermentation is an age-old technique in food processing and has the following advantages:

1. Removes anti-nutritional factors; 2. Removes unpleasant flavours; 3. Improves texture/flavour/colour; 4. Improves storability; 5. Reduces cooking time; 6. Impro-ves protein quality/quantity and 7. Improves digestibility.

A few fermented products from oilseeds are,

Tempeh, Natto, Miso, Soy sauce from soybean-solid products.

Oncom from peanut presscake-solid product.

Bongrek from coconut presscake-solid product.

The fermented foods prepared with sufficient aseptic precautions aid in prevention of contamination with toxic organisms.

Oilseed Proteins in Non-vegetarian Diet

Vegetable proteins find a place in meat products mainly because of their following functional properties:

a. High water binding capacity which prevents the formation of jelly in a cooked, mixed meat product.

b. Fat binding capacity which prevents separation of fat in a meat product when cooked.

The textured products from oilseeds can replace many meat products because of their characteristic texture and can serve as meat extenders i.e., to be added in substantial amounts without any significant adverse effect on taste.

This addition is particularly popular for meats to be frozen, since the slightest denaturation of meat protein caused by freezing results in an increased cooking loss, which may be offset by replacing a certain percentage of meat proteins with

appropriate vegetable proteins. Poultry and fish processing sectors can also effectively blend their products with suitable vegetable proteins to enhance the quality and taste of end-products.

Conclusion

The processing industry world over is in a technical improvement revolution that will lead to tastier and flatulence-free products. They will have longer shelf life, allow higher product yields and give a variety of diets. The newer processes of oilseed proteins should include methods for making superior quality protein concentrates and isolates.

In a developing country like India, the vegetable proteins which are already being consumed, need not be completely replaced by some products which have undergone a complicated manufacturing process, thus adding to the cost of the diet. But, one can suggest food uses for that part of the oilseed-meal which is going to other countries as animal feed, for human consumption within the country in the best acceptable form, to overcome protein-malnutrition. Also, this would help adding variety to monotonous diet, giving due considerations to the costs involved in texturising any oilseed/vegetable proteins. Any research work on these lines should take into consideration the aforesaid important aspects before going into any new product development from the 'protein-rich' oilseeds.

The fermented foods prepared with sufficient aseptic precautions aid in prevention of contamination with toxic organisms.

The textured products from oilseeds can replace many meat products because of their characteristic texture and can serve as meat extenders

References

Anon (1995). Business Line. Chennai, Dec. 13.

Ahraf Pal, M. (1998). Mobilisation of available resources for adequate protein production. *Indian Food Industry.* **17(1)**:41-47.

De Cuckle, T.S., Zapata, L.E., Silva, G, Cabrerea, J.A., De Sandoval, A.M, Ben-Gera, I, Riveros, H and Shomer, I. (1979). Two food applications of cottonseed flours and meals, In: Proceedings of World Conference on Vegetable Food, Proteins. *J. Oil Chemists' Society.* **56(3)**: 297-299.

Johnson, L.A, Suleiman, T.M and Lusas, E.W. (1979). Sesame protein: A review and prospectus. In: Proceedings of World Conference on Vegetable Food, Proteins. *J. Oil Chemists' Society* **56(3):** 463-468.

Prasad, M.V.R. (1994). Growth should accelerate. *Survey of Indian Agriculture:* pp 49-53.

Sosulski, F. (1979). Food uses of sunflower proteins. In: Proceedings of World Conference on Vegetable Food, Proteins. *J. American Oil Chemists' Society* **56(3):** 438-442.

Spadaro, J.J and Gardner, H.K. (1979). Food uses for cottonseed protein, In: Proceedings of World Conference on Vegetable Food, Proteins. *J. Oil Chemists' Society* **56(3):** 422-424.

Extrusion Processing of Foods and Feeds

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Introduction

Over the last few decades extrusion technology has played an increasingly important role in many industries such as food, feed and polymer and its future is still promising. Extrusion is a multivariable unit operation i.e., mixing, shearing, cooking, puffing and drying in one energy efficient rapid continuous process. This process of HTST, extrusion bring gelatinisation of starch, denaturation of proteins, modification of lipids and inactivation of enzymes, microbes and many antinutritional factors. The extrudates are texturally and histologically restructured. Considerable efforts had been made to develop high protein-rich extrudate from various sources, such as fish, livestocks, microbial cells and oil seeds only. But high production cost and low efficiency of protein conversion by livestock make plant protein more suitable for dietary protein intake. Thus, the present challenge to the food technologists and scientists is how to present nutritive ingredients in the form of recognizable foodstuffs from cheaper easily available plant sources. So, the most plausible answer to use the newer food materials is to transform into a fabricated food. Acceptable food is characterized by its texture, which is determined by its micro-structure. Within technological limits the food technologist may control both the composition of starting material and processing variable to direct alteration for nutritional, textural and physical optimisation.

Protein Supplemented Food and Feed

Ordinarily cereal flours, tubers and their derivatives can be processed into snack food, breakfast cereals, confectionery items and precooked modified liquefied starches. Legumes and oil cake-based material can be transformed into texturized vegetable meat extenders, meat analogues. Mixture of cereals and protein sources like legumes and oilcakes can be transformed into ready-to-eat or semi-cooked food with higher protein level. After oil extraction, the meals can be heat-treated by extrusiion cooking in order to increase their nutritional value by denaturation of proteins and or inactivation of antinutritional factor.

Over the last few decades, extrusion technology has played an increasingly important role in many industries such as food, feed and polymer and its future is still promising.

Mixture of cereals and protein sources like legumes and oilcakes can be transformed into ready-to-eat or semi-cooked food with higher protein level.

Different legumes and oil cakes blending with cereals, different expanded noodles, soup powder and flake type products can be developed (Table 1).

The objective of feed formulation is to supply the nutritional requirement for optimum growth from locally available cheaper raw materials for prawn. Pelleting is the most popular method for producing crustacean feed, due to its technological and economic advantages. The final characteristics of the pellet depend on the variable of the manufacturing process. High cost fish meal is the most commonly used protein source in fish diet due to its high biological value. Heat- treated soybean and sunflower meal have been shown to be a good substitute for fish meal proteins. Extrusion technology can also be exploited in the production of aquatic feed using by-product of food industry namely soycake, groundnut cake, deoiled rice bran etc. The extrusion parameters can be so effectively controlled, so that, one can get both sinking type and floating feed as well as slow sinking type feed, which first floats on the surface of water and then sinks slowly after absorption of water. The different feeds combinations of aquatic feeds is shown in Table 2.

Extrusion Variables

Extruders provide the most efficient means of converting electrical and mechanical energy into thermal energy for cooking feed and

Table 1. Combination and Proximate Composition (%) of Snack Foods

Main ingredients	Taste imparting ingredient								Nutrient			
	Salt	Onion	Dextrose	Garlic	Citric acid	Flavour	Butter	Cheese	Carbohydrates	Proteins	Fat	Fibre
Snack Rice-chickpea	+	+	-	+	+	+	+	-	72	19	4	3
Corn-greengram	+	+	-	-	+	-	-	-	68	24	3	3
Sorghum-lentil	+	+	+	-	+	+	-	+	76	15	1	4
Soup powder corn, hydrolysed proteins	+	+	-	+	-	+	-	-	78	12	2	4
Wheat-whey proteins	+	+	+	+	+	+	-	-	79	10	3	4
Rice-hydrolysed proteins	+	+	+	+	+	+	-	-	82	10	2	4
Flake-corn-greengram	+	+	+	+	-	-	+	+	78	15	1	4
Rice-prawn	+	-	-	-	-	-	+	+	78	15	2	3
Rice-caseine	+	-	-	-	-	-	-	-	83	10	3	4
Noodles Wheat - soyprawn	+	-	-	-	-	+	+	-	71	19	3	3
Barley soy-wheat	+	-	-	-	-	+	+	-	70	20	4	4
Rice-milk solid-wheat	+	-	-	-	-	+	+	-	74	16	4	3

Table 2. Proximate Composition of Aquatic Feed

Major constituent	Minor constituent			Nutrients				
	Salt mix	Vit mix	Binder	Proteins	Fat	Fibre	Ash	Nitrogen free extract
				%	%	%	%	%
Soycake, mustard cake, wheat flour, vegetable oil	+	+	+	34	8	7	12	30
Soycake, mustard cake, wheat flour, vegetable oil	+	+	+	30	8	8	11	34
Soycake, fish meal, rice bran, corn flour, wheat flour, mustard cake	+	+	+	40	5	6	12	30
Fish meal, soycake, mustard cake, rice bran, corn flour, wheat flour	+	+	+	35	5	6	11	36

Table 3. Quality Assessment Test for the Extrudate

Parameters		Process / Instrument required
Physical properties		
	Bulk density	Standard laboratory procedure
	Expansion ratio	Standard laboratory procedure
	Viscosity	Brookfield viscometer
Sensory quality		
	Crunchines, Cohesiveness	Panel of expert judges
	Juiceness, Hardness, Sponginess	Panel of expert judges
Mechanical properties		
	Fracturability,	Universal textural testing machine (Instron)
	Shear strength	Universal textural testing machine (Instron)
	Water stability	Standard laboratory procedure
Microstractural Properties		
	Uniformity, Cavitation, Fibre formation and alignment, gelation	Scanning Electron Microscopy (SEM) & Transmission Electron Microscopy (TEM) -- do --
Functional properties		
	Water absorption index	Standard laboratory
	Water solubility index	-- do --
	Fat binding, Rehydration ability, Cookability	-- do -- -- do --
Nutritional properties		
	Proteins, Fat, Carbohydrates,	Standard laboratory
	Digestibility coefficient,	-- do --
	Protein efficiency ratio,	-- do --
	Feed conversion ratio and	-- do --
	Nutrient leaching	-- do --

food formulations. The quality of an extruded product determines its success, failure, or product life. So, it is important to understand which extrusion processing parameters and ingredient interactions influence product quality. Extrusion processing variables that directly control product quality attributes are called independent variables. Changes made to independent variables affect the functional properties of the extrudates and process data i.e., dependent variables as such. All these variables are shown in Fig 1.

In most of the cases, powdered raw materials of a particular mesh size are used. The powdered raw materials are then sent to the cyclone separator unit for separation of the fine dust. The powdered materials from blending mixture are tempered by adding pre-determined amount of water and mixed thoroughly to adjust feed moisture content in between (15-25%) level. The blending mixtures are then allowed to equlibrate before extrusion. In general, single screw extruders are used. The length to diameter ratio of the barrel is 20:1 and screw compression ratio 1:1 to 1:4 is maintained. The extruder is provided with electrical brand heaters (over the barrel) and a temperature control facility. In general, the temperatures of the feed and com-

Extruders provide the most efficient means of converting electrical and mechanical energy into thermal energy for cooking feed and food formulations.

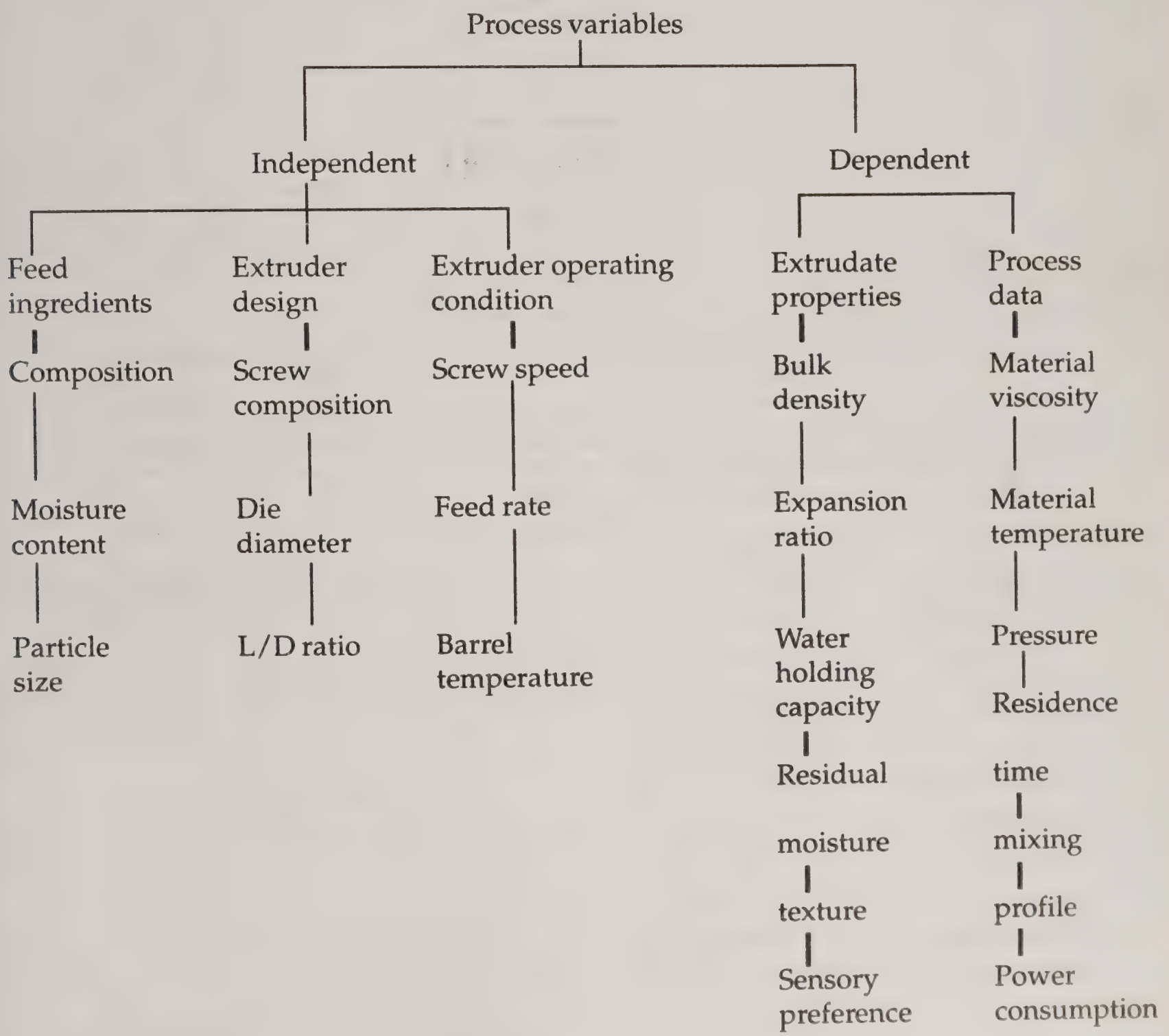

Fig 1. Variables in extrusion processing

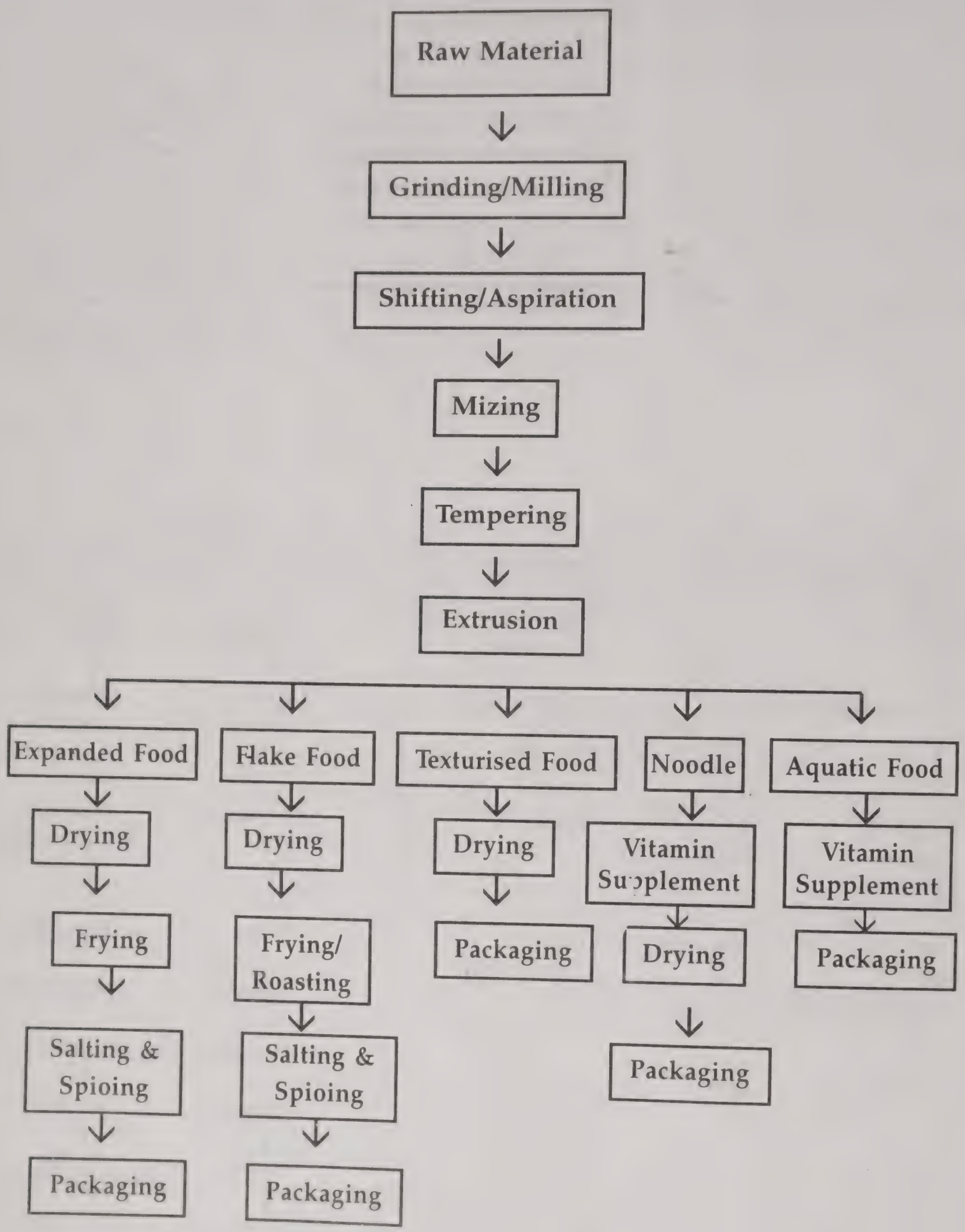

Fig 2. Extrusion process and quality control

Product Profile

* Infant food
* Instant beverage
* Cooked whole grains
* Quick cooking vegetable
* Breakfast cereals
* Pre-cooked flour
* Pre-cooked grits
* Crisp breads
* Bread sticks
* Croutons
* Instant noodles
* Reaction hydrolysis
* Dusoplings
* Pregelatinized starch
* Snack foods
* Textured vegetable protein
* Meat analogues
* Pet food
* Vegetable protein treatment
* Animal feed
* By-product treatment
* Meat products
* Pasta
* 3-generation
* Snack foods
* Biscuits and bread
* Tortillas
* Food bars
* Structured proteins
* Confectionery
* Frozen product
* Butter/margarine

pression zones are kept constant, while metering zone temperature varies from 120° C to 200° C depending upon the products. A screw-operated feed hopper feeds the extruder at a variable screw speed. The extrudates are collected when the operation is at steady state as indicated by smooth extrudate production and constant barrel and product temperature. The necessary quality control testing required for the different types of extrudate are shown in Table 3.

Application of Extrusion Process in Food System

Extrusion is a new equipment which is a continuous conveyor reactor. This could be used as mixer, heat exchanger, pressure vessel, reactor, shearing device and expander. This tool is applied in product areas such as expansion at high pressure of products.

Necessary precautions for extruded food and feed industry are as follows:

(1) Continuous power supply should be assured in case of power failure even for a short duration. The operation has to be stopped for not less than 2 hrs, resulting in production losses.

(2) Repair and maintenance require high level of skilled labours. Being mostly imported machinery, it should be noted that spares are not generally locally available.

(3) There should be no interruption during processing. Being a continuous process technology, the process can not be stopped at will, because start up time is high.

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Bibliography

Arkroyd, W and Doughty, J. (1964) Legumes in human nutrition. Food and Agricultural Organisation of United Nations Rome p 68.

Balaz G.H, Ross, F and Brooks, C.G. (1973) Preliminary studies on preparation and feeding for crustacean diet. *Aquaculture* **2**:369.

Chang, Y.H. and Hii, C.Y. (1992) Preparation of starch phosphates by extrusion *J. Food Sci* **57**:203.

Cogritt, M., Papotto, G., Stefani, L. (1985) Extruded snack food technologies In: Pasta and Extrusion Cooked Food, Ch. Mercir and C. Cantarelli (eds.) Elsevier App. Sci. Pub. London. p 174.

Delapena, L.D., Chuy, Y.N. and Ganchero, F. (1987) Evaluation of various legumenous seeds as protein source for milk fish *Asian Fish Sci.* **1**:19.

Flores, A.E. and Martinez, S.E.Z. (1993) Critical operation on manufacturing of pelleted feeds for crustanceans. *Aquaculture* **14**:83.

Glavez, F.C.F, Resurreccion, A.V.A. and Ware, G.O. (1995) Formulation and process optimization of mung bean noodles. *J. Food Processing Preservation.* **19**: 191.

Harper, J.M. (1981) Extrusion of foods. CRC Press, Boca Raton.

Food Quality Assurance : Microbiological Concerns

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Introduction

Food quality assessments can be done on several planes using several quality attributes. The end product of any manufacture reflects the quality built into it from the beginning of its production and is a window into the attitudes of the management and supervisory personnel at all levels. Quality cannot be achieved in a day; not can it be claimed for a day to serve the immediate purpose of inspection or acceptance. There has to be consistency in it. Every lot and every batch from every day and every month must be uniformly of the same quality agreed upon before a contract of purchase is concluded. Claims to superiority of a food product must not only include nutrition, facts, freedom from toxic chemicals and non-essential food additives and preservatives, but also wholesomeness and safety from the microbiological perspective. Microbiological quality is one of the most cryptic quality parameters in a dynamic system such as food.

The end product of any manufacture reflects the quality built into it from the beginning of its production and is a window into the attitudes of the management and supervisory personnel at all levels.

There are different threats to food quality originating from microbial sources (Table 1). These are i) several pathogenic bacteria, some of which have long been known in connection with food poisoning and some appear to be emerging as new threats; viruses which are water borne; parasitic types associated with both vegetable and meat foods ii) toxins of bacterial, fungal and fish origins iii) spoilage causing organisms which cause off-odour and off-tastes leading to economic losses and iv) bacterial and fungal rots of fruits and vegetables as well as a large number of live bacteria and fungi in prepared/processed foods presenting an unwholesome appearance of the food product leading to rejections.

The presence of pathogens is not perceivable generally by any sensory tests and therefore goes unrecognised. Very sensitive and reliable tests are needed to detect them, especially because they occur in small numbers, but are capable of causing infections, or lead to toxin production in foods due to growth during temperature abuse.

Where does quality recognition begin so as to take measures for its assurance and control?

Table 1. Threats to Food Quality of Microbial Origin

Pathogens	Toxins	Spoilage	Unwholesome
E. coli, Salmonella spp, *Shigella, Campylobacter, Listeria, S. aureus, Vibrio* spp. *E.coli 0157:H7 Protozoan parasites, Helminth parasites, Viruses*	Enterotoxins Neurotoxins Verotoxins Haemolysins Mycotoxins Paralytic fish poison Mushroom alkaloids	Free fatty acids Ammonia Polyamines Bitterpeptide Organic acids Putrid compounds Fermentation	Excessively moldy, High number of bacteria, Yeasts in mats, Slime forming lactic acid bacteria, Faecal coli

Foodchain : Assurances All Along the Way from Farm to the Warehouse

Most R & D laboratories attached to production units do not particularly concern themselves with microbiological testing for various reasons. When the need for controls does arise, supervisors tend to depend largely on the application of some form of high temperature treatment (if included in the process) to destroy the microbial contaminants. This view has been held for a long time. The single most important outcome of today's quality awareness is that not the isolated assurance steps and not the end product examination alone for quality or safety, but the assurances obtained all along the foodchain namely starting from the source of the raw material through preparation, processing and handling to the finished end product moving along its distribution and storage when finally it is being used by the consumer - are the key to the success and safety of a product - fresh or processed.

Certification under ISO 9000 series for commercial recognition seems to have become an attractive and already much mentioned term. Quality begins with materials after the management decides to do something about this elusive quality. In a food system using largely fresh produce from agricultural and animal husbandry sources, the quality of these raw materials varies as widely as nature and the existing agricultural practices will allow.

Microbial contamination of raw materials is inherently high and the condition is exacerbated with intensive farm practices. For e.g., *Campylobacter*, one of the most important human pathogens to be recognised in recent years is widely associated with poultry birds and red meats. Intense rearing and controlled feeds have been identified as the principal causes of the presence of *Campylobacter* in large numbers on chicken and chicken related products (Comi *et al* 1984).

To contrd *Campylobacter*

Campylobacter, one of the most important human pathogens to be recognised in recent years is widely associated with poultry birds and red meats.

spread in the environment through food and water, poultry farming practices have to be modernised. Sanitization of cages, faecal droppings and soil, feed water and slaughter areas are essential. Niche formation in the butcheries and faulty practices for the disposal of the offals and used water lead to the persistence of the organism in the environment (Rier Steniner *et al* 1985).

The concept of using specific pathogen free (SPF) chicks for poultry rearing must be brought into practice and integrated with hygienic farming. This method has been successfully tested in Scandinavian countries (Smulders, 1987). There is not much a butcher or a retailer can do to control the safety of meat from

Pasteurization is insufficient to destroy the excessive microbial loads that fresh milk carries and post-pasteurization contamination is very evident in the sachet milk.

an animal which harbours and acts as a carrier for the pathogen. Our own observations have shown that *Campylobacter* is present in the majority of the birds and that it is more prevalent in some farms than in others and the survives in packaged refrigerated broilers as well as in the wash water thrown out of the slaughter premises. Considering the importance of our own thriving broiler and egg industry, our quality assurance protocols must also address this problem.

Dried spices and fresh milk are two other universally used food commodities, which are of agricultural origin and have the ability to contaminate foods prepared with them. Better harvesting, cleaning and drying methods should replace the conventional production of spices in our country. Automatic milking systems would go a long way in reducing external and essentially avoidable contamination in milk. Pasteurization is insufficient to destroy the excessive microbial loads that fresh milk carries and post-pasteurization contamination is very evident in the sachet milk. Obviously, the answers to these problems lie in understanding where the process of food production is deficient in the management of controls.

Procedures to Remove Contamination after Harvest

Contaminants originate at the farm level. While organic farming and more restrained and informed use of chemicals to prevent post-harvest losses may help in reducing chemical contaminants to some extent, the problem of dislodging microbial contaminants is not simple. Sewage water used for irrigation purposes often leads to the concentration of pathogens in the soil and on the vegetables grown in this soil. Greater awareness of the dangers from such unhygienic farm practices has to be created particularly in small farm holdings, while at the same time creating amenities and

infrastructure for better and more modern farming. Both large and small scale farmers would benefit.

Meanwhile, cost effective and simple post-harvest clean up procedures for chemical residues and microorganisms must be devised, tested, introduced and demonstrated to be effective. These measures must be adaptable at the farm level, so that cleaned materials are sent to the wholesale and retail markets. Such preventive measures will, to some extent, curtail the losses and rejection rates of the foods manufactured from the contaminated raw materials and a greater number of products may then be able to measure up to the international standards of quality and safety. In the considered view of the author, the quality assurance of foods points to the 'farm' as a pivotal point from where all control measures could originate and radiate outward. In essence, quality of food is deemed to begin in the farm (Fig. 1).

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Microbiological Quality Assurance Concepts in Food Processing

Linear Integrated Product Safety (LIPS) procedure better known now as Hazard Analysis

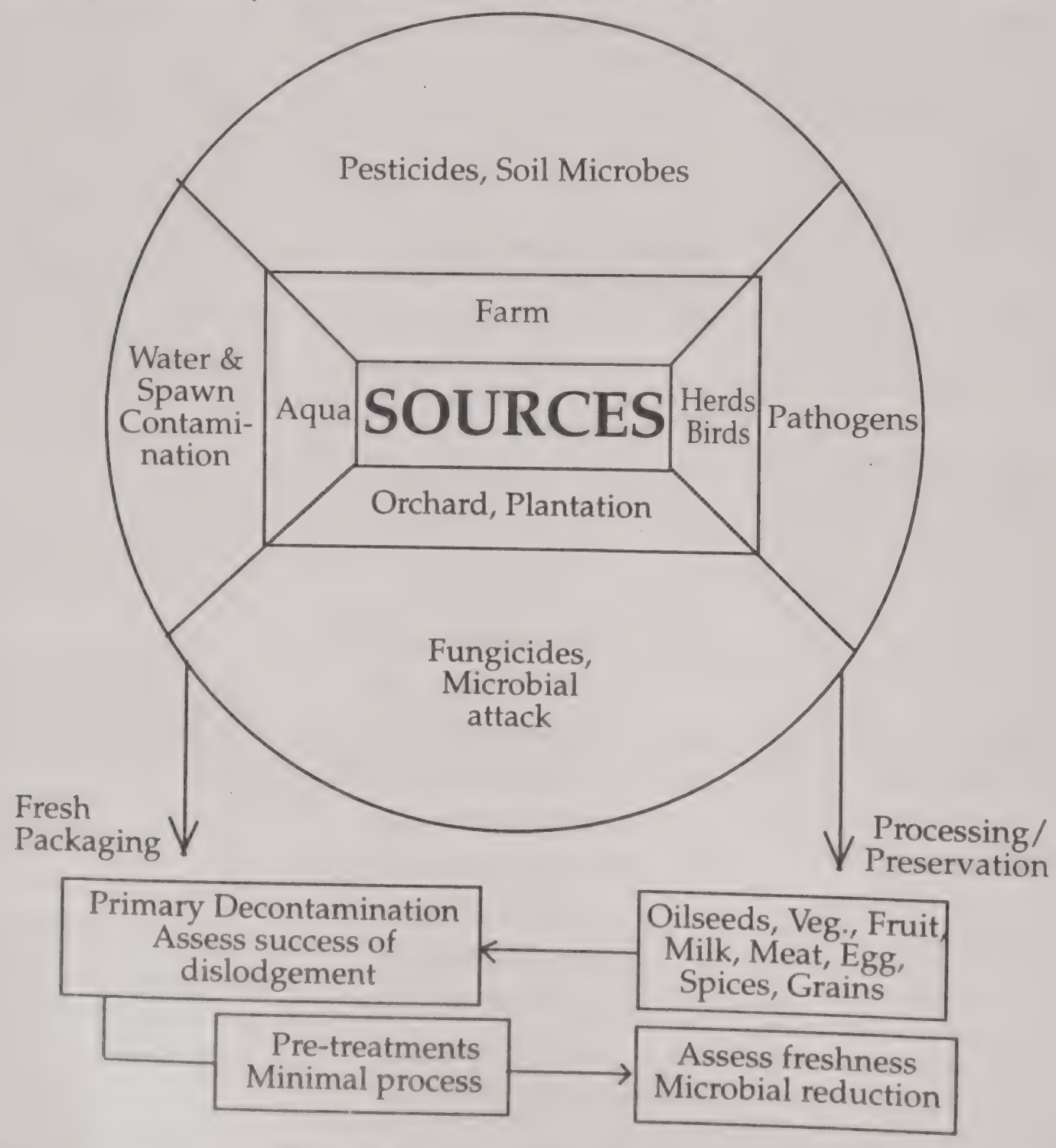

Fig. 1 : Where does quality begin in foods

Critical Control Point (HACCP) concept originated in the mid 70s when the need arose for producing consistently safe foodstuffs for NASA's manned space programmes (Felix 1987; Mortimore and Wallace 1994). The necessity of testing small batches of repeatedly produced foods led to an impossible situation which used more food for sampling than for actual mission. In trying to cut costs to the minimum and reduce the excessive effort and the time required for repeated testing, the programme of HACCP was conceived by the US food industry, Pillsbury Co., itself. This procedure invokes the concept of Total Quality Management (TQM) as it is being publicised today for achieving a zero defect product. The method requires that the quality of all the raw materials be defined and identified in respect of contaminants and pathogens (hazards), assess the risk through using these materials in prepared/processed food (Analysis), identify where in the manufacturing line there could be process failures which might lead to the reintroduction of hazards and /or points where maximum damage to the product might occur (critical control points), devise control measures and apply tests to monitor these points (control). When the flow line is streamlined and documented and the plant personnel made aware of the system, it is relatively easy to exercise control throughout the manufacturing line by using only a few 'on line' sites for testing and monitoring.

Every product must have a dedicated HACCP programme. The original effort is worth its time, expense and care in order to ensure troublefree and quality assured end product each time. HACCP programmes are being written into the ISO 9000 document meant for food products manufacture.

Tests for Monitoring Microbial Contaminants, Pathogens and Toxins

Essential for Success in Quality Assurance

Extensive data and information are available on microbiological testing procedures to determine the concentration of various organisms, to detect pathogens and to assay microbial toxins. In a well equipped laboratory, both instrumental and non-instrumental methods can be used. For testing 'on site' and for obtaining results rapidly during a manufacturing shift, there are few test systems and the ones that may be used are beyond the reach of many. Raw materials can be screened very thoroughly in the quality assurance/quality control laboratory as well as the end products themselves.

Extensive data and information are available on microbiological testing procedures to determine the concentration of various organisms, to detect pathogens and to assay microbial toxins.

There is an urgent need to create a data base for primary, secondary and tertiary microbiological attributes in respect of foods and food ingredients produced and used in our country, and at all stages of their processing, handling, packaging and storage.

Conventional methods like using solid and liquid microbiological media, incubation at different temperatures, microscopy and carrying out biochemical and serotyping tests are very reliable and useful but require more than 24 h minimum to obtain results. In our country, we do not have access to many of the miniature biochemical test kits with multiple reaction systems manufactured in foreign countries. The antisera for typing are prepared only for a few organisms within the country and most of the sera have to be imported directly or obtained at high cost through dealers. There are delays in obtaining them. Shelf life of such reagents under the storage and handling system prevailing in India is severely limited.

Mossel *et al* (1994) presented a summary of the breadth and range of microbiological tests with realised and unrealised potential and used in various R & D laboratories, in the food industry and in medical microbiological laboratories. These include the conventional methods as well as the very modern analytical techniques which may be of use in the microbiological monitoring of foods. To achieve a high level of quality assurance capabilities, we must use atleast some of these modern methods.

The attributes to be considered in the primary selection of tests aimed at markedly enhanced simplification and acceleration are (a) microbiological criteria such as sensitivity and reliability comparable with conventional reference methods, (b) operational criteria like sample preparation time, effort and speed of operation, performance of and dependence on reagents, training of manpower and technical services (c) economics of acquiring

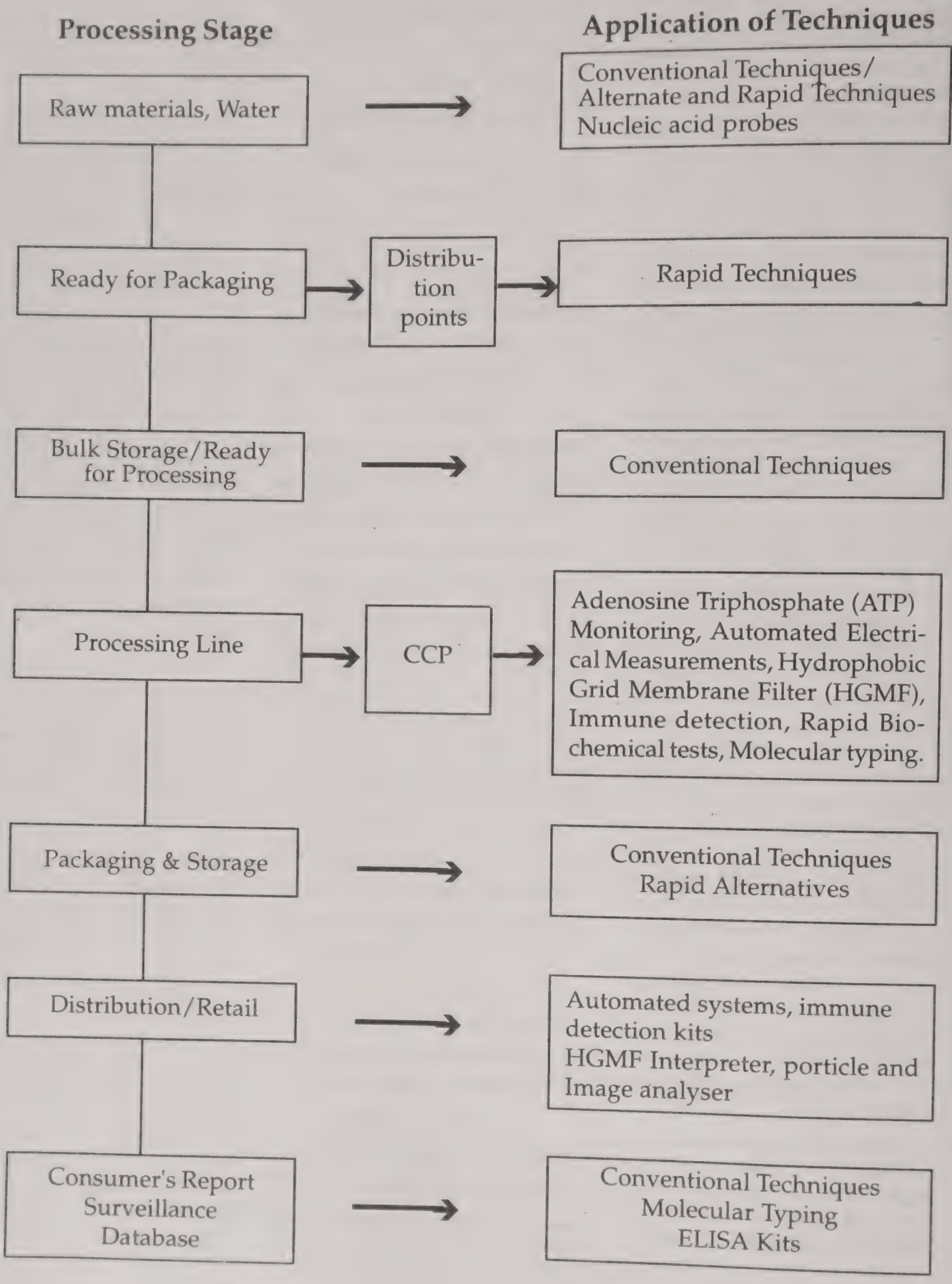

Fig. 2 : Where and how of microbiological assessment

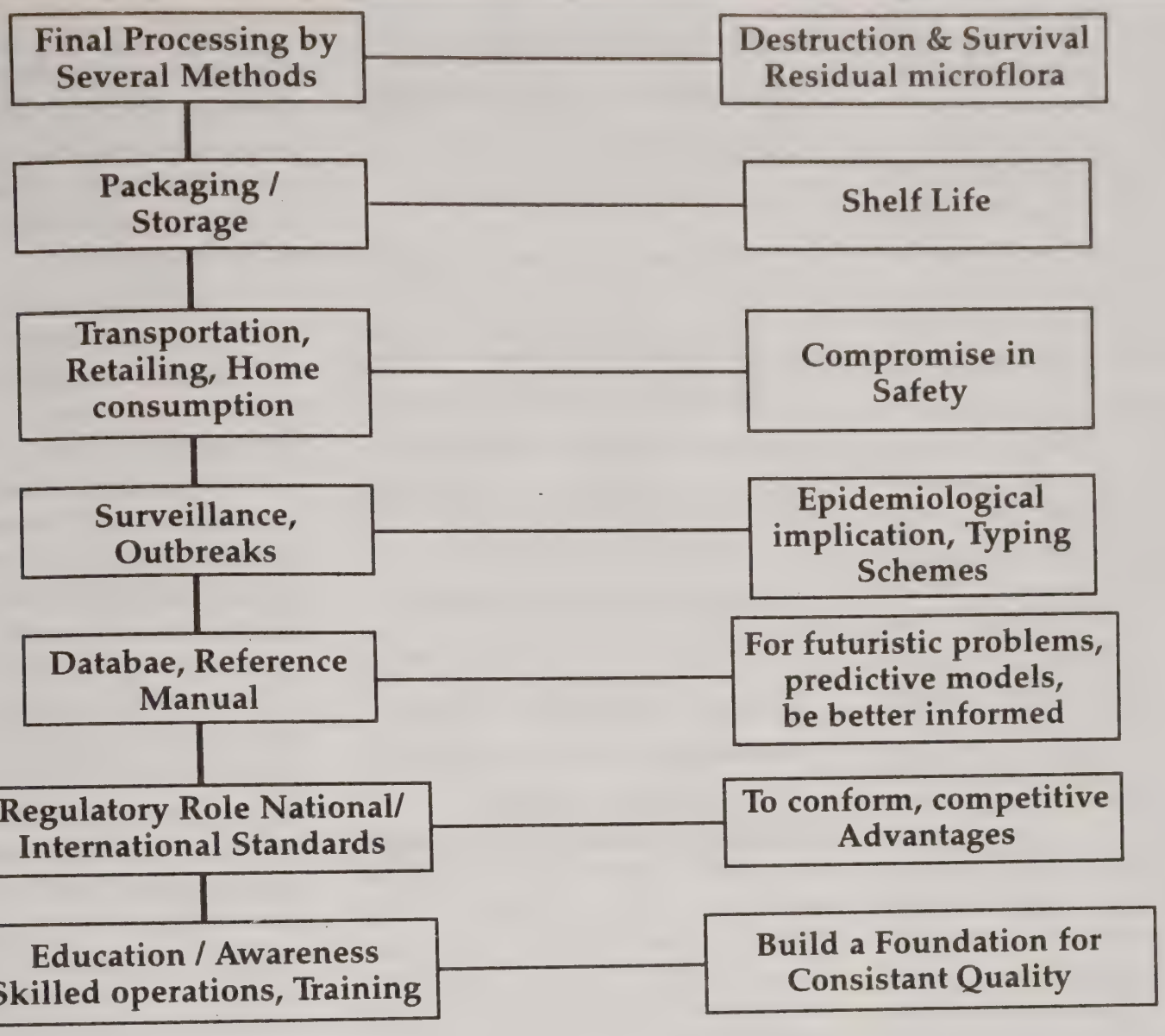

Fig. 3 : Why do we need assessment

and using the test system and keeping it in running condition and (d) acceptability of results by concerned people and the regulatory agencies. Where these different techniques could prove to be useful in a food chain is graphically depicted in Fig. 2.

Obviously, we in India have not come to first base in respect of many of these analytical instruments and other methods which could be used as rapid monitoring systems. While advanced analytical instrumentation is available for chemical testing and identification (Chromatographic systems, GC-MS etc.) there seems to be a reservation both on the part of the scientists in the laboratories, of the industry and R & D establishments to use one of the new and advanced systems in microbiological analysis. From the experience of the author, the reasons for this state of affairs are found to be lack of information on the performance of the instrument, high capital and recurring cost and poor after sales services.

In both DFRL and CFTRI, quality assurance personnel and food technologists respectively are being trained at the post graduate level, but their numbers are few.

One can only surmise from this that microbiological quality is not taken very seriously as yèt unless it is used for export clearance of foodstuffs and that the industry is unwilling to invest adequately on R & D on instruments and on technically competent, trained and experienced microbiologists. Much of the current training, research and development and innovation is coming from the Govt. Institutions and a few university departments with limited funding. The support from the industry is wanting, whether in running research programmes or in developing new techniques and instruments. Dealing with imported goods under commission and supplying new technical packages, kits, instruments, reagents and media seems to be the height of achievement of the commercial houses with little or no experience in microbiological matters. The production of high quality media is still a lacuna in the Indian scene notwithstanding the admirable efforts of some companies to provide these products. There is scope for competition in this sector.

Data Base

Why do we need quality assessment (Fig 3) is question which can be answered with the reply - we

need it to build a sound foundation for achieving consistent quality in our food production and manufacture. The foundations are based on expert knowledge and information and data generated from real time and 'in silico' studies on the behaviour of microorganisms in relation to processing, shelf life and safety of foods and gathering of epidemiological data.

There is an urgent need to create a data base for primary, secondary and tertiary microbiological attributes in respect of foods and food ingredients produced and used in our country, and at all stages of their processing, handling, packaging and storage. A centralised information bank is the need of the day. A certain amount of data has already been generated by various laboratories, universities and the private industry. Compilation, analysis and categorisation of the data pertaining to the extent to which various practices affect contamination and colonisation of perishable and shelf stable foodstuffs may be done from the existing reports and fresh research. Surveillance data on outbreaks of food related microbial diseases are very sparse. There is not much follow up work done on the suspect samples and on the isolation of etiologically implicated pathogens or toxigens, or on the characteristics and nature of the organisms and their growth capabilities under various temperature abuse states.

Since there is no data base created, there is no way to alert, caution and prepare for eventualities. Predictive modelling studies are required to be undertaken on the possibilities of a given organism being able to grow in a particular food or/ and survive a processing procedure and spoil the food during storage under a set of conditions.

To create a comprehensive quality assurance procedure, pre-existing data are also needed for reference and to work guide manuals.

Technical Training, Education at Vocational, Undergraduate and Post Graduate Levels

Who needs trained, competent and skilled people? A few R & D laboratories in large multinational run (MNC) manufacturing units may employ some of them. They (MNC) depend largely on automation and computerised process control systems and a few skilled floor staff. With the advent of further sophisticated systems using fuzzy logic, robotics and artificial intelligence, they may entirely do away with the human element. While they have their business executives and managers, who needs a trained and expert microbiologist ?

Both under BIS and Prevention of Food Adulteration Act (1954) microbiological standards and end product specification do not exist for a large number of foods sold in the market.

Small or medium scale manufacturers who depend largely on unskilled labour with a rapid turnover rate for their products have little concept of quality or hygiene or safety and have even lesser interest in the quality assurance aspect. They certainly do not want trained experts.

New life styles in the 21st century demand new product types with better packaging at economical pricing.

The vast majority of the 'in-between' group of industries who deal directly or indirectly with food processing and packaging need expert guidance by technically competent people and they also need skilled manpower.

We require classical microbiologists and food microbiologists with research experience as well as trained analytical technicians. Laboratory supplies, equipment maintenance and service personnel, skilled operators for sterilisation of media and glassware and support personnel are also essential for quality assurance laboratory. In both DFRL and CFTRI, quality assurance personnel and food technologists respectively are being trained at the post graduate level, but their numbers are few. Though food science has become a vocational subject at the undergraduate level in many Universities in recent years, the inadequately covered curriculum and the quality of training imparted leave much to be desired. And no one is really concentrating on developing the various skills needed in the food processing and packaging industries. Special efforts must be made to bring the quality of training on par with identified educational standards which will fulfil the practical and developmental needs of the growing food industry.

The Role of the Regulatory Bodies

Microbiological criteria, standards and analytical methodology are important factors in a smart quality assurance and control system. Both under BIS and Prevention of Food Adulteration Act (1954) microbiological standards and end product specification do not exist for a large number of foods sold in the market. Even fresh produce itself is not graded for quality or perishability. Consumers do not know if a perishable foodstuff could be stored at home for any length of

time without compromising its microbiological quality or safety. The methodology for carrying out various microbiological tests has not been upgraded sufficiently, despite rapid advance in this field. No effort seems to have been made to undertake collaborative studies on an interlaboratory plane to introduce any new method. Microbiological information does not find a place on the product label. Risk groups and age are not identified or alerted. No warnings are given to the consumer about any wrong handling which might lead to a hazard or spoilage. The common consumer remains unaware of any cause for concern from temperature abuse of the product or of the possible microbiological hazards from a nicely packaged foodstuff. Should the mandate of the nutrition labelling not include such important information? A more proactive regulatory system would help speed up quality assurance efforts.

New Processes and Fresh Assurances

Food science and technology is developing in leaps and bounds. New concepts of processing have emerged. The trend towards 'fresh tasting', 'natural look', 'finished at home', 'semi-preserved high moisture' food is on the increase. New life styles in the 21st century demand new product types with better packaging at economical pricing. High safety thresholds and great convenience to the consumer in quickly preparing a wholesome food must be built in. Predictive modelling will come to play an ever increasing role in designing quality control measures. New safety issues on biotechnologically produced foods are cropping up to challenge us.

Urgent dialogues on these several them are indicated if the Indian Food Industry is to benefit from a modern Quality Assurance Programme.

References

Comi, G., Cantoni, C. and Marenda G. (1984). *Campylobacter jejuni* in chicken meat. *Archivio Veterinario Italiano*, 35(1) : 1-9.

Doyle M.P., Padhye V.V. (1989) Foodborne Bacterial Pathogens. Chapter 6, Published by University of Wisconsin, Madison, pp 236-259.

Felix, C.W. (1987). In: Food Protection Technology. Lewis Publishers Inc.

Mossel, D.A.A., Marengo, C.M.L., and Struijk C.B. (1994) In : Rapid Analysis Techniques in Food Microbiology. Patel, P.D. (Ed) Published by Blackie Academic and Professional, London, p. 1-28.

Prevention of Food Adulteration Act (1954) 13th edition, Eastern Book Co., Lucknow.

Rier Steiner, P., Schifferli, D., Lanz, E. Burgi, I. and Erb, C. (1985) Detection of *Campylabacter* spp. In slaughter animals and in environment samples in a slaughter house. *Schweizer Archiv fur Tierheilkunde* 127, 231-238.

Mortimore S. and Wallace C. (1994) HACCP - Practical Approaches to Food Control and Food Quality Series - 1. Chapman and Hall, London.

Smulders, J.M. (1987) Elimination of Pathogenic Organisms from Meat and Poultry. Elsevier Publishers, Amsterdam, New York.

ADVERTISERS' INDEX

Consumption of Processed Food Products Among Urban Families

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Introduction

A processed food is defined as one which undergoes processing, adding value to conventional and innovative basic food forms through various permutations and combinations of providing protection, preservation, packaging, convenience, transportation and disposability (Rao, 1989). In most of the countries, food is no longer something which satisfies one's hunger but one which promotes health and happiness. Even in developing countries like India, an entirely new range of processed foods flooded in the market like never before. The spurt of activity in processed foods has been brought about primarily due to the need for convenience demanded by changing life styles. The consumer of 1990's has changed tremendously from the consumer of 70's and this change is forecast to continue well into the year 2000. (Khaitan, 1989).

Rapid urbanisation and sociological changes, like the desire on the part of the housewives to spend less time in the kitchen, the increased value she places on leisure, the habit of eating out, women taking full time jobs, the weakening of family ties, the spread of television and its impact, the increasing difficulty and expenses involved in obtaining domestic help, finally the changing life styles and growth of foreign travel have created a demand for pre-packaged, pre-cooked food which is easy to handle and store, which could be cooked quickly and also ensures top quality, variety, taste and flavour (Srinivasan, 1967; Sami, 1970). In view of these changes taking place in our society, the present investigation was undertaken to study the trends in consumption of processed foods in the twin cities of Hyderabad and Secunderabad.

Three hundred house holds belonging to lower middle, middle and high income groups were randomly selected from different circles of the Municipal Corporation of Hyderabad city including Secunderabad. On the whole, six wards and twelve residential colonies were chosen from the selected circles of twin cities. The sample in the present study covered 300 house holds with working and non-working housewives, nuclear families and those definitely consuming processed foods regularly. Initially, enumeration of available processed foods was done by visiting super markets and based on the information a list of processed foods was prepared and a schedule was developed covering general information, expenditure on foods and frequency of purchase and consumption of processed foods having minimum of one month shelf life were included in the list. Coffee, tea, sugar are omitted purposefully for the study. After pre-testing the schedule, information was collected from selected housewives by personal interview.

A processed food is defined as one which undergoes processing, adding value to conventional and innovative basic food forms through various permutations and combinations of providing protection, preservation, packaging, convenience, transportation and disposability.

Purchase Pattern and Expenditure on Total Food and Processed Foods

Majority of the housewives purchased processed foods from super markets and general stores. However, housewives who were employed tended to purchase mostly from super markets and unemployed women from general stores. Very few unemployed housewives purchased from small kirana shops. This may be because these shops provided credit facility and also due to easy accessibility. Since super markets are one stop shops for all the required items, working women find it more convenient to stop at theses shops for the purchase while returning from offices (Table 1)

The frequency of purchase of food items was monthly in most of the families. The monthly expenditure on food ranged from Rs. 2000-3000 in middle income group and Rs. 3000-4000 in high income group.

Table 1. Purchase Pattern of Processed Foods Among Employed and Unemployed Housewives

Purchased pattern	Employed n = 123	Unemployed u = 177
Employment	123 (100)	177 (100)
Place of purchase		
a. Super market	64 (52)	52 (29)
b. General stores	59 (48)	120 (68)
c. Kirana shops	0	5 (3)
Frequency of purchase		
a. Weekly	12 (10)	32 (18)
b. Fortnightly	34 (28)	44 (25)
c. Monthly	77 (62)	101 (57)
Monthly expenditure on food		
a. Rs. 1000 - 2000	4 (3)	42 (24)
b. Rs. 2000 - 3000	56 (46)	84 (47)
c. Rs. 3000 - 4000	42 (34)	36 (20)
d. Rs. 4000 - 5000	21 (17)	15 (9)
Monthly expenditure on processed food		
a. Rs. 200 - 300	12 (10)	62 (35)
b. Rs. 300 - 400	44 (36)	58 (33)
c. Rs. 400 - 500	48 (39)	39 (22)
d. Rs. 500 - 600	19 (15)	18 (10

Figure in parenthesis indicate percentages.

Table 2. Percentage Expenditure on Food from Total Income and on Processed Foods

Expenditure %	No. of families	
	Employed	Umemployed
% Expenditure on food from total income		
15 - 25	8 (7)	5 (3)
25 - 35	63 (51)	84 (47)
35 - 45	52 (42)	71 (40)
45 - 55	--	17 (10)
% Expenditure on processed food from total expenditure		
5 - 10	8 (24)	54 (10.5)
10 - 15	102 (82.9)	110 (62)
15 - 20	17 (13.9)	12 (7)
20 - 25	1 (0.8)	1 (0.5)

Figure in parenthesis indicate percentages.

Table 3. Average Monthly Expenditure on Different Types of Processed Foods by the Families

	Employed n = 123		Unemployed n = 177	
	n	Rs.	n	Rs.
Beverages	123 (100)	25.8 (6)	163 (92)	36.6 (9)
Bakery products	123 (100)	23.3 (5)	177 (100)	19.6 (5)
Cereals	123 (100)	70.7 (16)	177 (100)	49.8 (11)
Pasta products	123 (100)	28.1 (7)	177 (100)	17.2 (4)
Energy & weaning foods	29 (23)	41.5 (9)	34 (19)	40.8 (10)
Snack foods	122 (99)	23.7 (5)	156 (88)	20.9 (5)
Cocoa products	101 (82)	17.0 (4)	89 (50)	18.8 (5)
Confectionery	112 (91)	15.2 (3)	129 (73)	15.8 (4)
Dairy products	123 (100)	89 (20)	177 (100)	101.9 (24)
Fruits and vegetables	123 (100)	71.9 (16)	162 (91)	44.9 (10)
Nuts and oilseeds	119 (97)	18.5 (4)	132 (74)	21.5 (5)
Spices	107 (87)	9.6 (2)	7 (4)	17 (4)
Others	123 (100)	13.7 (3)	1763 (97)	19 (4)
Total	-	**448.19**	-	**423.28**

Figure in parenthesis indicate percentages.

Table 4. Average Monthly Expenditure on Different Types of Processed Foods

Category	Employed n = 123						Unemployed n = 177					
	Lower middle income n = 42		Middle middle income n = 41		High Middle income n = 40		Lower income n =		Middle income n = 41		Middle income n = 41	
	n	Mean ± S.D.	n	Mean ± S.D. (in Rs.)	n	Mean ± S.D. (in Rs.)	n	Mean ± S.D. (in Rs.)	n	Mean ± S.D. (in Rs.)	n	Mean ± S.D. (in Rs.)
Beverages	42	18.0 ± 20.2	40	20.5 ± 21.1	38	39.9 ± 21.7	56	26.6 ± 22.3	68	40.0 ± 28.9	39	45 ± 13.6
Bakery products	42	18.07 ± 7.2	41	24.9 ± 10.1	40	27.2 ± 6.5	64	12.7 ± 4.9	73	19.9 ± 5.5	40	26.0 ± 8.3
Cerals	42	59.9 ± 12.2	41	70.6 ± 15.5	40	82.31 ± 12.1	64	39.8 ± 5.3	73	44.9 ± 10.6	40	61.2 ± 18
Pasta products	42	19.09 ± 8.3	41	27.5 ± 12.5	40	37.3 ± 9.2	64	12.2 ± 3.9	73	16.7 ± 6.0	40	26.2 ± 7.7
Energy & Weaning Foods	10	40.0 ± 0	6	40.0 ± 0	13	43.4 ± 2.3	7	40.0 ± 0	16	40.8 ± 2.5	11	41.3 ± 2.2
Snack Foods	41	19.6 ± 8.0	41	25.0 ± 5.4	40	26.7 ± 6.4	47	18.7 ± 4.4	70	19.0 ± 5.7	39	26.2 ± 8.4
Cocoa products	26	12.6 ± 5.3	36	17.3 ± 7.3	39	19.6 ± 7.6	12	22.5 ± 6.9	52	22.5 ± 6.9	37	28.3 ± 4.2
Confectionery	32	12.6 ± 4.4	40	15.5 ± 4.7	40	17.1 ± 3.1	40	11.2 ± 2.9	51	16.6 ± 4.0	38	19.6 ± 3.9
Dairy	42	82.1 ± 6.7	41	87.0 ± 5.9	40	98.1 ± 9.9	64	76.7 ± 19.5	73	108.1 ± 16.7	40	130.8 ± 22.5
Fruit and Veg. products	42	56.9 ± 23.4	41	72.5 ± 18.5	40	87.2 ± 13.6	52	28.4 ± 10.7	71	31.7 ± 13.7	39	64.2 ± 14.8
Nuts & oilseeds	39	12.3 ± 6.2	40	20.9 ± 14.3	40	22.2 ± 11.1	63	12.3 ± 4.4	69	17.4 ± 4.8	39	22.3 ± 8.6
Spices	30	9.2 ± 3.3	39	8.4 ± 2.9	38	11.1 ± 4.4	0	——	12	14.5 ± 5.5	5	18.0 ± 6.7
Others	42	11.9 ± 2.4	41	13.8 ± 3.5	40	15.5 ± 4.7	63	13.7 ± 4.4	71	19.3 ± 4.6	39	24.1 ± 5.5
Total		373.07		543.9		527.6		314.8		422.0		523.2
Average				458.0						420.0		

Table 5. Reasons for Purchase and Consumption of Processed Food by the Families

Priority reason score	I	II	III	IV	V	Total score	Rank
	5	4	3	2	1		
a. Employed housewives							
Time saving	120	3	--	--	--	612	I
Easy-to-prepare	3	120	--	--	--	495	II
Nutritious	--	--	68	46	9	305	III
Tasty	--	--	51	72	--	297	IV
Liked by family members	--	--	4	5	114	136	V
b. Umemployed housewives							
Time saving	4	168	5	--	--	707	II
Easy-to-prepare	3	215	1	--	--	878	I
Tasty	3	2	131	33	8	490	III
Nutritious	--	--	--	18	159	195	V
Liked by family members	--	--	41	126	--	375	IV

The monthly expenditure on processed foods alone ranged from Rs. 200-600, maximum being among employed housewives. The differences might be mainly due to leisure where they can prepare food on their own.

Expenditure Pattern

The monthly expenditure on food was 25-45 percent of the total monthly income in 93 percent families with employed women and 87 percent in families with unemployed women. When expressed in term of expenditure on processed foods from expenditure spent on food, it ranged from 5-25% and maximum number of families spent 10-15% (Table 2). Similar results were reported by Shaw *et al* (1993), where the expenditure on processed foods ranged from 5-25% out of total expenditure on food. The foods purchased were soft drinks, biscuits, ice-cream, noodles, bread, butter, jam, chocolates, snacks and ready-to-**make mixes.**

Expenditure on Different Types of Processed Foods

Monthly expenditure on processed foods by employed housewives on an average was Rs. 489.00 which was higher than the unemployed women. As the income raised, the expenditure on processed food has increased. Food products like baked foods, cereals, pasta products (Vermicelli), dairy products and fruit and vegetable products were purchased by 100% of the families (Table 3). Expenditure was maximum on dairy products followed by fruit and vegetable products and cereal products. Dairy products such as, butter, ghee, *paneer* were most frequently purchased. Jam, ketchup, pickles, raisins, squash were the most common fruits and vegetable products consumed. Breakfast cereals such as corn flakes, puffed rice and rice flakes were the commonly purchased cereal products. Puri and Sanghera (1989) conducted a study on consumption pattern of some processed foods and reported that jams, orange and pine apple squash were consumed by all families studied irrespective of income. Rege (1992) has reported the impact of media in the success story of Rasna in India. Vermicelli was the most popular pasta product purchased by all the families. Popcorn, potato chips were most commonly consumed snacks. Biscuits were the most common item purchased by all. Expenditure on processed foods by employed housewives was significantly higher ($P<0.01$) than unemployed housewives. It was also observed that correlation between income and expenditure on food was significant in both employed and unemployed housewives. (Table.4)

The sample in the present study of covered 300 households with working and non-working housewives, nuclear families & those definitely consuming processed foods regularly.

The reasons for consuming processed foods were time saving, easy-to-prepare, nutritions, tasty and liked by family members.

Reasons for the Use of Processed Foods

The reasons for consuming processed foods were time saving, easy to prepare, nutritions, tasty and liked by family members. Employed housewives ranked time saving aspect of processed food as the most preferred reason whereas unemployed women ranked 'easy to prepare' aspect as most preferred reason. Nutritious aspect of processed food ranked third by employed women, whereas it was the last preference by unemployed women (Table 5). This may be due to the difference in educational level and awareness on the nutrition knowledge. Shaw *et al.*, (1992) showed similar results stating that use of processed foods, saved time of cooking as first priority Choudari (1989) has reported that 53% of people pay extra for convenience, 77% for variety of preparation, 73% for trying out new recipes, and 71 per cent for reliable quality of processed foods.

The results of this study show that there is a good demand for processed foods in middle and high income groups of families. As the income increased the expenditure also increased on processed foods, more so in families having employed housewives.

References

Choudari S (1989) The market for processed foods in India. *Indian Food Industry.* **8**(3): 10-12.

Khaitan A (1989)Processed Foods in AD 2000. *Indian Food Industry* 6. **5**(3):113-116.

Puri R. and Sanghera T (1989) Nutritive value and consumption pattern of some processd foods. *Indian Food Packer.* **43** (4) : 67-70.

Rao C (1989) The market for processed foods in India. *Indian Food Industry.* **8**(3) : 10-12.

Rege D. V. (1991) What ails the Indian Food Industry. *Indian Food Packer.* **45** (5) : 7-127.

Sami S. S. (1990) Food Processing Industry in India. *Indian Food Packer.* **44**(5) : 90-96.

Shaw A, Mathur P and Mehrotra N. N. (1993.) A study of consumer attitude towards processed foods. *Indian Food Packer.* **47**(2) : 29-41.

Srinivasan S. (1967) Food through recent decades. *Food Industry* J. (35):13-15.

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Andheri (East), Mumbai - 400 069

Multi-Purpose Cleaner/Degreaser

The SC-100 Protective Soil Remover is an all-purpose, aqueous cleaner/degreaser. It contains no caustics, glycol ethers, petroleum distillates, terpenes, reagents, builders or VOCs. A non-toxic, readily biodegradable, non-ionic surfactant system and non-pH-dependent, dielectric, anti-oxidant, it releases and

suspends organic soils without damage to cleaning surface and is highly filterable and reuseable.

For more details write to :
Gemtex Product Inc,
Dept CN, 1118,
East Missouri Ave,
Phoenix,
Arizona 85014, USA

Foot-operated Switch

Precision Engineering has developed an exclusive foot-operated switch, named Prince, the ninth in their foot switch range. The switch is mainly used in bio-medical equipment like X-ray machines, dental equipment and other electronic instruments for the medical profession and also in screen printing, sealing and packing machines, conveyors, etc.,

For more details write to :
Precision Engineering Corp.
4082, Nahar & Seth Indl. Estate,
Pannalal Compound
LBS Marg, Bhandup,
Mumbai - 400 078

High Pressure Cleaning Systems

Farm Implements (India) offers hot/cold water high pressure cleaning systems from Weidner Reinigungssystene OHG of Germany. The product range includes : high pressure hot/cold water cleaning pumps (upto 1,500 bar), rotary disc machines, floor scrubbers, tank cleaning systems, waste water treatment plants, automatic car/truck wash systems, central inplant cleaning systems and vacuum cleaners. The machines are portable, compact and sleek in design having high performance pumps and boilers to suit a variety of cleaning operations in industry and consumer applications like automobile cleaning, pipe cleaning, decreasing, paint removal, sand blasting, steam jet cleaning, cleaning and sterilization in hospitals, hotels and cleaning of agricultural machinery. For maximum utilisation, the machines can be fitted with different accessories suitable for various applications.

For more details write to :
Farm Implements (India) Pvt. Ltd.,
10, Kumarappa Street,
Nungambakkam,
Chennai - 600 034

Quick Stopper Plug for Leakages

MC-Fix-ST is a prepacked polymer modified, ready-to-use mortar for quick and permanent sealing of leakages in basements, after tanks, underground structures, galleries, tunnels, dams, cellars, pipes etc., Only the water is to be added at the sites. The mortar plug develops very high strengths in about 5-7 minutes and its stone hard. The bonding and water proofing properties are excellent and the sealing is permanent. This product sets hydraulically within minutes without shrinkage. The mortar is chloride free and does not saponify thereby no loss of strength occurs over the passage of time. The application is very simple. First, chisel the leakage spots or the cracks in dove tail fashion, remove loose particles, dust, etc and moisten the prepared surfaces. Mix MC-Fix-ST in small quantities with water knead it into a paste and mould it into a plug shaped mass. Hold it immediately against water leak in the prepared joint and press to ensure that no voids are left. Hold it in place until it sets either with hand or trowel The setting time can be accelerated by using warn water to adjust with the work rhythm. MC-Fix-ST is a universal waterproof quick leakage stopper and can be used everywhere, where a reliable and permanent leakage stopping is required even against the hydrostatic pressure. It is an ideal aid while carrying out waterproofing jobs especially where continuous seepage of water does not enable any waterproofing system applications. If still drier surfaces are required, a slurry of MC-Fix-ST can be applied, to take care of even damp surfaces.

For more details write to :
MC-Bauchemie (India) Pvt. Ltd.,
201, Vardhman Chambers,
Sector 17 Vashi,
Navi Mumbai - 400 705

Automatic Tank Level Gauge

Wess Level Controls manufacturers a float-operated automatic level gauge for accurate measurements of liquid levels in the fixed roof and floating roof tanks at pressures up to 1 bar. It uses a large surface area float and keeps the total system hysteresis to a minimum even in a turbulent surface. Special design is available for high pressure applications. The level can be read by the nearest millimetre. This gauge can be used for custody transfers in petroleum and petro-chemical industries. It can be fitted with a range of data transmitters to transmit the data to a control room. These transmitters are flame-proof and approved by BASEEFA and CMRS for safety. The products are manufactured in technical collaboration with **Whessoe Varec Ltd, UK.**

For more details write to :
Wess Level Controls Pvt. Ltd.,
28/4B Kharadi, Off Nagar Road,
Pune - 411 014

Demineraliser

Ion Exchange (India) Ltd. has introduced the Indian Rapide Demineralisers as per new generation package water treatment plants for the industrial and commercial sectors. These demineralisers are fully automatic twin deionisers with a short cycle operation which assures high purity water at all times and costs less than the conventional system. The high purity water produced caters to the exacting require-

ments of industries like pharmaceuticals and electronics. This high efficiency range of demineralisers is manufactured under technical licence from **Elga Ltd., UK.** The operational cycle of these rapid-regeneration units is controlled by volume throughput, which is pre-programmed into the programmable logic controller according to the type of feedwater. The ion exchange resins are never fully exhausted, thus ensuring optimum deionised water production at all times. Regeneration takes approximately 30 minutes - after a service cycle of just 2-6 hours - eliminating the need for both stand by place and storage of large volumes treated water. As regeneration of the cation and anion beds is simultaneous, the effluent streams are largely self-neutralising, reducing waste disposal costs. The units are exceptionally compact and are mounted on a corrosion-resistant frame, which also accommodates a stainless steel multi-purpose pump. In addition to optimising plant performance during service and regeneration, the pump provides a number of recirculation options maintain the high quality of water at all times in the treatment water tank. Models with different flow rates are available within the range to suit specific needs.

For more details write to :
Ion Exchange (India) Ltd.
Tiecicon House, Dr. E Moses Road, Mumbai - 400 011

Screw Conveyer

Comet offers a screw conveyer for horizontal, inclined (90^0) applications. This equipment is employed for conveying free flowing materials like chemicals, grains, flours, fertilisers, abrasive materials, etc. It can also be designed to be used as mixer, agitator, stirrer, for blending of dry fluid ingredient, Jacket screw conveyor is also supplied to work as drier/coolant. Comet offers 75 mm dia to 1,200 mm dia screw with standard pitch and taper pitch. The screw conveyer is also made of mild steel and stainless steel 304/316 quality to suit user's requirement. The screw surface may be continuous and discontinuous; band like, ribbon, paddle. Continuous screws are used mainly for conveying dry fine granular and pulverised material. Ribbon and discontinuous screws are effective with lumpy material. Besides, blade and blend like screws are used in cases when thorough intermixing of materials during conveying is essential.

For more details write to :
Comet Engineers
Nirmala Rubber & Boards Compound, I B Patel Road,
Goregaon (East) Mumbai - 400 063

Humidity Sensor

Smartee BV of The Netherlands has introduced a high performance humidity sensor, SMTRH-05 with long term stability and close tolerances. Due to a special designed thick film technology, the sensor is ruggedised and based on barrier of thin aluminium oxide material, the sensor can withstand high mechanical stresses. Most of the capacitance sensors have 10% to 90% RH, while Smartec humidity sensor has linear capacitance ranging from 0% to 100% RH within band of 2%. Condensation at 100% RH has no effect on performance of humidity sensor. Operating temperature range is from 40^0C to 100^0C. The humidity sensor finds applications in air conditioner, climate control for green house, food processing, room comfort control, medical etc.,

For more details write to :
Nippon India
3, Chowdhary Building,
1st Bhatwadi, Mumbai - 400 004

Air Particle Counter

Hiac/Royco-USA, has introduced 0.1 uM sensitivity air particle counter Models - Micro Air 100 and Portable 100. The common features of micro Air 100 and Portable 100 are 6 size channels 0.1, 0.2, 0.3, 0.5, 0.7 and 1uM. The open cavity helium neon laser based design sensor, 7 digit LED display, concentration limit 999, 999 particles/CFT. 500 samples data storage, automatic FED209E calculations, optional printer and RS232/RS485 output. The differences between two models are - Micro Air 100 : High flow rate ICFM. mains operation 220VAC/50 Hz. Portable 100 : Flow rate 0.1 CFM, battery operated weight 4.5 kg. The application areas of particle counters are clean room class 10 and better filter testing, hospitals, food, packaging plants, microelectronics production, semiconductor process areas, pharmaceutical plants etc.

For more details write to :
Electronic Enterprises (India) Ltd.,
216, Regal Indl. Estate,
A Donde Marg
Sewri, Mumbai - 400 015

Scrubbers for Fumes and Cleaning Gas

Motive Powers has developed low-cost scrubbers for industries, specially for small and medium industries. The scrubbers are made out of non-corrosive material and provide positive exhaust after scrubbing. Gases are washed and soluble gases are dissolved and removed from air streams. The system, normally complete with fan, pump etc, comes fully assembled and ready-to-use. Also offered is total consultancy in air pollution control.

For more details write to :
Motive Powers INC
A8, Kumkum Apts.
161 S V Road,
Ville Parle (W),
Mumbai - 400 056

NEW MACHINERY

Paramagnetic Oxygen Analysers and Gas Analysis Systems

M & C Instruments b v of The Netherlands manufactures oxygen analysers using the paramagnetic measuring principle. Although the magno-dynamic type of measuring cell has been manufactured by others, M & C developed a cell that is unique in the field which has been patented throughout the world. It is a compact, reliable and fast responding cell. Components for gas sampling are the basis for all analyser sample system designs. M & C sampling probes feature ease of service, compact dimensions and versatility.

For more details write to :
Analyser Instrument Co. Pvt. Ltd.
5-B-7, Vigyan Nagar, Kota,
Rajasthan - 324 005

Intelligent Totaliser-cum-Rate Indicator

The Selectron Model RC102 is an intelligent totaliser-cum-rate indicator for all totalising and rate indicating applications in systems that provide pulse signals. Application areas include textile, flow metering, extrusion, piece-counting and similar type of production and process monitoring. The unit has a programmable scale factor over a wide range (0.00001×10^{-3} to 9.99999×10^{2}). This facilitates the reading of the rate and totaliser value directly in desired engineering units. The instrument can be set to display either 6 digit total or 4 digit rate value. When selected to display total, it shows the total number of pulses received multiplied by the scale factor. The least count of the display can be selected between 0.01, 0.1 or 1 via DIP switch at the rear. In rate mode, the instrument automatically selects the display resolution and displays the input pulse rate from 4.000 to 9999 units per minute. Excellent stability and good response time are the special features of the rate indication. As a security, the scale factor can be locked using a DIP switch. The totaliser value and scale factor are retained for 10 years in case of power failure. An inbuilt 12 V DC (± 10%) supply is provided for powering various sensors such as proximity switches. The instrument works on 230 V AC/110V AC/24 V AC or 24 V DC or 12 V DC (factory-set). It is housed in a DIN enclosure of bezel size 48 mm x 96 mm and requires a panel cut-out of 45 mm x 95 mm with 120 mm clear space behind the panel.

For more details write to :
Selectron Process Controls
E-120, Ansa Indl. Estate,
Saki Vihar Road,
Andheri (E), Mumbai - 400 072

Feeding Systems

Rhein - Nadel Automation (RNA) GmbH of Germany, manufactures equipment and systems for storing, orienting and feeding mass products. The equipment include blow and linear feeders, hoppers, elevators and conveyors, stepping feeders and control systems. The systems include : complete feeding systems to meet most component requirements, including handling systems and control units for handling mass products and complete conveyor systems for the transport of components and for linking machines. The equipment ensures reliable feeding and orienting of a large range of components used in most industries such as electronics, engineering and pharmaceutical.

For more details write to :
Mechatrol
No. 80, 4th Main,
17th Cross,
Lakkasandra,
Bangalore - 560 030

HDPE Chemical Tanks and Containers

Chirag plastic containers are made from special chemical grade HDPE/LLDPE specifically suited for a wide range of chemicals such as acids, alkalies, various effluents, organic and inorganic chemicals. The containers are available in different shapes - round & rectangular, and sizes ranging from 100 to 15,000 litres. Chirag tanks and containers find use in chemical, metallurgical, textile, pharmaceutical, pollution control, paper and other industries. The containers can be used for effluent treatment. The company's electroplating tanks are being used in electroplating, viz., zinc, copper, aluminium, chrome plating etc. It also undertakes manufacture of tanks and containers as per user's specifications.

For more details write to :
Chirag Enterprises
F-123, Phase II, Basni, Jodhpur,
Rajasthan - 342 005

Acid and Effluent Treatment Units

Motive Powers Inc has developed effluent treatment plant keeping in mind small quantity of effluent to be treated as well as space shortage. The acid treatment unit specially treating metal either for metal plating, has to use acid for cleaning and washing. Tanks holding the acid treat these metal pieces and components by dipping in it for some time as such, spillage and drain out after weakening of acid liquid generate acid effluent which is not permitted to be discharged in the drain. This plant comes in three sizes, 250 litres, 500 litres and 1,000 litres. Each size represents the volume to be treated at a time.

Depending upon the size, system has a tank with microaeration

unit and caustic support vessel. It also has high grade gravity filter. Effluent is filled in the tank as a batch and caustic solution is added in. Micro aeration starts operating and in a short time, acid is degraded. This liquid containing salt is then passed through high pressure gravity filter and clean water is discharged for the drain. Another problem faced by small industry is to reduce BOD below permissible limit in the effluent. It is the presence of organic matter in the effluent in the secondary line which give headache to small industries. Motive Powers offers effluent treatment unit for bringing down BOD to the desired level. It is made in three sizes, viz. 5,000 litres/day, 10,000 litres/day and 20,000 litres/day.

For more details write to :
Motive Powers Inc.
B/19 Crystal Apartments,
Sagarmalkani Complex
Jogeshwari, Mumbai - 400 102

Dissolved Oxygen Sensors

Bela Instruments offers these sensors which provide the user with a modular design that permits easy repair and component interchange ability. The D200 (19 mm) and D400 (25 mm) series of OxyProbe dissolved oxygen sensors are available in several configurations. This allows them to fit the wide array of installation requirements found in steam sterilisable and autoclavable applications in the food, beverage and biopharmaceutical industries. The Models D200 and D205 represent the standard configuration for 19 mm head plate fittings used by many fermentation vessel and bioreactor manufacturers. The Models D400 and D405 are the conventional configurations that fit all standard (Ingold) 25 mm side wall ports, found in most large scale fermentation vessels and bioreactors.

For more details write to :
Bela Instruments
6/309, Jogani Industrial Complex,
Near ATI, V N. Purav Marg
Chunabhatti, Mumbai - 400 022

Hardness Tester

Affri Wilson of Switzerland offers hardness testers with Rockwell, Brinell and Vickes scales. Features include : absence of counter weight to eliminate vibration errors; N units instead of kgf load, high speed (2 seconds) test, keyboard setting of measurement data and immediate conversion of the direct value into other scales. Lower and upper tolerance limits selection is possible. Checking of the test cycle, feed and return stroke is automatic. It is possible to obtain the list of stored values, mean and statistics. Also available are hardness testers for silica, rubber etc.,

For more details write to :
Heatly & Gresham (India) Ltd.
E-47/4 Okhla Indl. Area, Phase-II,
New Delhi - 110 020

RESEARCH ROUND-UP

A Process for Meat Paste from Layer Chicken Developed at CFTRI, Mysore

A recipe was optimized for improving spreadability, sensory attributes, texture and emulsion characteristics and shelf-life of meat paste from layer chicken. The process involves mincing and cooking of layer chicken meat, mixing spices and other additives along with chicken stock and blending to obtain the product of pasty consistency. The process needs simple equipment such as Mincer, Blender/ Grinder, Bowl chopper, Retorts, Canning machineries that are available indigenously. The capacity of the plant can be sized according to the raw material availability. The past prepared from layer chicken is homogenous in nature with stable texture and emulsion characteristics. The canned paste can be stored at ambient temperature (26 ± 2^0C) for 6 months without marked effect on texture, emulsion and sensory characteristics of the product. The paste can be used as such as bread-spread snack food or can be a base material for the preparation of traditional products like *kofta*, cutlets etc.

Details may be obtained from Director, CFTRI, Mysore - 570013

CFTRI Develops Virus-free Banana Saplings

In a significant achievement, Indian scientists have developed a workable technique to micropropogate virus-free saplings of the elite "Nanjangud Rasbale" variety of banana from diseased plants through tissue culture. According to the Council for Scientific and Industrial Research (CSIR), scientists at the Central Food Technological Research Institute (CFTRI), Mysore raised three hundred virus-free saplings from the infected plants of the variety using aseptic tissue culture technique. These saplings are presently being field tested at the institute's campus. This elite local variety of banana is well known for its sweetness, but is also susceptible to diseases, especially viral diseases, which affect its growth, reduce the fruit yield and ultimately kill the plant. The viral diseases persist through generations, reducing the productivity of the plantation crop. Adaptation of the technique developed by the plant cell biotechnology department of the CFTRI would help farmers to have virus free crops of the fruit.

Breakthrough in Sorghum

In order to evolve high yield and disease resistant varieties of sorghum, a breakthrough has been made by the scientists of CCS Haryana Agricultural University, Hisar. Researchers of biotechnology and molecular biology department at the University have identified certain gene fragments responsible for providing resistance to particular diseases of sorghum, which is used both as fodder and food crop employing genetic engineering techniques. According to department Chairman Dr. H. S. Nainawate, Dr. K. S. Boora, a scientist in the department under the guidance of Prof. J. B. Chowdhury, a renowned plant biotechnologist and University Vice-Chancellor and Prof. Clint Mangill of the Texas Agricultural and Mechanical University, has isolated and characterised a gene fragment that provides resistance to sorghum plants against leaf blight disease. The resistance breeding assumes significance in view of the scarcity of good quality green fodder during summer season. In northern states, sorghum is used as a fodder crop while in southern parts of the country, it is grown as a staple food crop.

CIFA Recommends Vitamin E for Prawns

Vitamin E drugs form an essential ingredient in a scientist' kit at the Bhubaneswar-based Central Institute of Freshwater Aquaculture. (CIFA) these days, for reasons other than their known beauty enhancing capabilities. The aquaculturists have evolved a new method of improved prawn growth rate by incorporating the vitamin in the arthropods' diets. Under the multi-centric mission mode project on semi-intensive prawn aquaculture, the institute produced 5.32 tonnes of pellet feeds last year for prawns and carps to meet the project requirement, thanks to the improved prawn diet. When fed with the wholesome diet standardised through constant research on prawn feed, a higher growth rate of the prawns was reported. Studies were carried out at the institute's control and polyhoused ponds during winter last year and the results showed that growth of post-larval stage of the prawns was much higher in those fed with Vitamin-E diets.

Alternate Technology to Methyl Bromide Fumigation

With growing awareness of ill-effects of environmentally questionable chemical pesticides, the scientists around the globe are working on alternative technology for insect elimination. The technology of centrifugal force is slowly but steadily gaining popularity. A technology has been developed to clean whole grain using centrifugal force and aspirations, and the scourer aspirator (ESA). The ESA's centrifugal impact action effectively cleans dry and tempered wheat and other grains. Grain is hurled against impact pins, dislodging hulls, grease, dirt, rodent hair, wheat beards and beeswing as well as destroying internal and external insect life. The impact action of the unit can be closely controlled for either deeply infested grain or grain that is relatively clean. The result is minimum grain breakage and minimum fragment count. After impact, grain is thoroughly scoured in a swirling action against the conicle inner surface of the scouter casing and discharged into the aspirator section. Grain is dispersed against the housing in a very thin film. Uniform air velocity throughout the aspirator separates the debris with maximum efficiency and carries it to the dust collector. In many cases, the cleaning produced by this equipment improves the yield and lowers the ash. The proven capabilities of centrifugal force make it a safe, economical and effective option for mills of all sizes.

Genetic Engineering *Vis-a-Vis* Food Safety

Molecular biologists and the biotechnology industry are making radical alterations to our food and environment through genetic engineering. While traditional breeding techniques can exchange genes between similar species, genetic engineering allows the insertion of genes from any plant or animal into any other organism.

Genetic engineers can take a gene from a fish and insert it into tomato, put a gene from chicken into potato, transfer a lettuce gene into a bacterium or put a human gene into a radish or carrot. The removal of species barriers to reproduction makes it possible to design novel plant varieties or alter farm animals to meet specific economic goals. Genetically modified tomatoes, corn, salmon, potatoes, cheese, soybean, etc. have already been commercialised in US.

It is believed that in the next ten years almost all the food we consume would be genetically modified in one form or the other. This has given rise to a serious and pertinent question. Are the genetically modified products safe to human health?

The biotechnology industry claims genetically altered crops are absolutely safe and pose no danger to humans. According to them, genetic engineering is another step in the history of agricultural technology just as the introduction of tractors, fertilisers and plant breeding. However, many are not convinced and are sceptical of the industry's claim.

Genetic engineering routinely moves proteins into the food supply from organisms that have never been consumed as foods. The protein product of the inserted gene may cause unexpected reactions and produce potentially toxic products. There is also serious concern about the dangers of using genetically engineered viruses as delivery vehicles (vectors) in the generation of transgenic plants and animals. This could destabilize the genome of the host and also possibly create new and dangerous viruses.

The process of genetic engineering can thus introduce new allergens and toxins into food that were previously naturally safe.

The presence of antibiotic resistant genes in foods could have harmful effects such as reducing the effectiveness of antibiotics when they are taken with genetically engineered foodstuff. If the resistant genes are transferred to human pathogens they will become immune to antibiotics.

Apart from risk to human health, there are also religious feelings involved. Muslims and Jews may want to be absolutely sure that the transgenic foodstuff they consume does not contain any pig gene. Orthodox Hindus would like to avoid crops that have cow genes. Vegetarians may insist that the potato or tomato they eat does not consist any animals gene.

In India, genetically modified cotton of Monsanto is undergoing field trials but no genetically modified foodcrop is grown. This does not guarantee us immunity from the hazards of genetically modified foodstuff as India resorts to periodic import of many food items.

Further, there are no proper regulations and guidelines regarding testing and marketing of genetically modified crops in the country exposing us to the harmful effects of genetically altered food products.

Therefore, the strategy to ensure food safety should begin before introducing the genetically changing products to the market by thoroughly testing for possible side effects from all possible angles.

DATA BANK

Composition of Food Processing Industry

	(percent)
Oils and fats	36.0
Dairy products	18.9
Cold beverages	15.6
Beverages	15.3
Indian food	1.4
Western food	1.5
Bakery products	6.5
Confectionery	3.5
Processed fruits & vegetable	1.3

Source : Report of Working Group on Food Processing Industry for the Ninth Five Year Plan, Ministry of Food Processing, Government of India.

Profile of Food Processing Industry Segments

	(Industry Size - Rs. 77,000 Crore)
Oil & vanaspati	17,000
Liquid milk	13,500
Sugar	8,500
Bakery	4,000
Cereals	3,400
Indian sweets	2,700
Tea & coffee	2,400
Confectionery	2,000
Spices	400
Total market share of the industries (As specified above)	**75%**
Others	**25%**

Note : Figures in Rs. Crore *Source : Express Investment*

Taxation in Food Processing

	Value added		Capital equipment	
	Excise	Sales	Excise	Import
Malaysia	Nil	Nil	Nil	Nil
Thailand	Nil	7	Nil	5
Indonesia	Nil	12	Nil	5-15
Philippines	Nil	10	Nil	10-20
India	8-40	5-12	10-40	20-50

Note : Figure in percentage *Source : CII-McKinsey FAIDA Report*

DATA BANK

Employment in Food Processing Industry Since Liberalisation

	Approvals (Jt. ventures, Foreign collaboration Industrial licences & 100% EOU)		Industrial Entrepreneurs Memoranda (IEMs)		Total employment
Sub-sector	**Number**	**Employment**	**Number**	**Employment**	
Urban	80	15,000	563	59,000	74,000
Non-Urban	880	242,000	3,392	572,000	814,000
Total	**960**	**257,000**	**3,955**	**631,000**	**888,000**
			4,020*	**636,000***	

* *Cumulative till April 1997*

Note : Employment in number of persons; these are cumulative since liberalisation (March 1991-97)

Source : Press Information Bureau, Government of India)

Investment in Food Processing Industry Since Liberalisation

Sub-Sector	Approvals (Joint ventures, Foreign collaborations, Industrial licences and 100% Export-oriented units)			Industrial Entrepreneurs Memoranda (IEMS)	
	Number	**Total investment**	**Foreign investment**	**Number**	**Total investment**
Grain milling and grain-based	65	784	423	243	4,728
Fruit and vegetable products	335	4,198	779	321	2,783
Meat and poultry	49	1,334	418	63	358
Deep sea fishing, fish processing and aquaculture	181	2,102	552	98	427
Fermentation industry	204	1,936	488	340	6,999
Consumer industry including soft drinks/mineral water/confectionery etc.	61	5,139	4,562	338	5,500
Milk and milk products	19	716	297	1,017	12,901
Others including food additives, flavours etc	46	662	235	-	-
Edible oil/oilseeds	-	-	-	1,535	12,644
Total	**960**	**16,871**	**7,754**	**3,955**	**46,340**
				4,020*	**46,791***

* *Cumulative till April '97*

Note : Figures in Rs. Crore; these are cumulative figures since liberalisation (March 1991-97)

Source : Express Investment

DATA BANK

Projected Demand/Target for the Terminal Years of the 9th Plan

Item	Units	1995-96	2001-02
GRAIN PROCESSING SECTOR			
1. Output from roller flour mills	Million tonnes	9	12
2. Output from rice mills	,,	120	133
3. Maize processing	Lakh tonnes	80	154
4. Pulse processing	,,	14	17
5. Bakery products			
a) Biscuits, rusks etc.,	,,	12	44
b) Bread, cakes etc,	,,	14	30
6. Paste products	,,	1.4	6.5
7. Pulses based products (*Bhujia* etc)	,,	3.6	4.6
8. Cereals & pulses based mixed & value added primary processed products	,,	1.2	4.5
HORTICULTURE BASED PRODUCTS			
1. Fruits & veg.products covered under F.P.O	,,	10	30
2. Fruits & veg. in informal sector	,,	1.6	30
3. Coconut based products	Thousand tonnes	20	100
4. a) Cashewnut	Lakh tonnes	3.7	8
b) Value added cashewnut products	,,	10	50
5. a) Walnut	Thousand tonnes	25	35
b) Value added walnut products	,,	Negligible	10
6. Ground spices mix	,,	95	250
7. Spice oil, oleoresin & mixed value added spices flavours	,,	10	30
MILK PRODUCTS			
1. Milk products including baby food	,,	200	300
2. Malted food	,,	48	100
3. Condensed milk (other than *khoa*)	,,	9	20
4. Butter	,,	68	120
5. Ghee	Thousand tonnes	115	200
6. Cheese	,,	5	20
7. Casein	,,	1	8
8. Lactose	,,	Negligible	10
9. Traditional products like *khoa & paneer*	Lakh tonnes	5.5	15
MEAT & POULTRY PRODUCTS			
1. Buffalo meat	Million tonnes	1.2	1.8
2. Beef	,,	1.26	1.6
3. Mutton & goat	,,	0.68	0.9
4. Pork	,,	0.4	0.5
5. Poultry meat	Lakh tonnes	0.45	1.0
6. Processed meat & poultry products	Lakh tonnes	0.5	1.5
7. Processed egg products	,,	0.4	2.0
FISHERY PRODUCTS			
1. Production of Fish	Million tonnes	4.8	6.5
2. Processed fish products	Lakh tonnes	4.0	8.0
CONSUMER GOODS			
1. Beer	Million litres	350	600
2. Potable alcohol	,,	620	800
3. Coca products	Thousand tonnes	44	70
4. Soft drinks	Million tonnes	165	400
5. High protein foods	Thousand tonnes	15	20
6. Soya products	,,	30	60
7. Energy foods	,,	120	400

Source : Report of Working Group on Food Processing Industry for the Ninth Five Year Plan, Ministry of Food Processing, Government of India

Food Products Requirements in India By 2001

	(Million tonnes)
Cereals	172
Wheat	53
Pulses	23
Millets	21.6
Tubers	21.1
Milk	60
Fats	14
Sugar	12.7
Oilseeds	39
Vegetables	67
Fruits	39
Fish	2.62
Various Meats	2.30
Eggs (Trillion No's)	33

Source : Report of Working Group on Food Processing Industry for the Ninth Five Year Plan, Ministry of Food Processing, Government of India.

TRADE FAIRS & GET-TOGETHERS

IFCON - 98

Technical Programmes

Technical Sessions

A total of about 12 technical sessions are planned, which include lead papers and keynote presentations by eminent persons with rich experience in their respective areas. The proceedings of the presentations at IFCON-98 will be published by AFST (I) soon after the conclusions of the conference.

Poster Sessions

Any registered participant can present upto two posters of original work (not presented/published anywhere) in any area of Food Science and Technology. However, a student member can present only one poster as "Registered Student Delegate".

Poster papers will be classified according to the topic or subject as listed in the Souvenir. Details about poster presentations will be included in the programme indicating time, poster board number and location. The abstracts will be published in the abstracts volume of the convention. Abstracts of the poster papers should be submitted as per the guidelines.

Areas identified for poster presentations are :

- Food processing machinery
- Process design and scale up, modelling, simulation
- Newer developments in food processing
- Food microbiology
- Food safety and quality
- Food biotechnology and tissue culture
- Analytical methods
- Fruits, vegetables and plantations products processing technology
- Confectionery, convenience foods and bakery products
- Oils and fats-science and technology
- Grain science and technology
- Food protectants, infestation control and preservation
- Fermentation and enzyme technology
- Food packaging
- Health foods, speciality foods and nutraceuticals
- Traditional foods
- Animal products technology
- Dairy products technology
- Sensory science/quality
- Biochemistry and nutrition
- Database and management

Plenary Session

The convention will conclude with a plenary session anchored by eminent persons from academia and industry and participated by all the delegates, who will deliberate on the important issues of immediate relevance to the development of food science and technology and formulate suitable recommendations.

Focal Themes and Topics for Technical Sessions

Health Foods and Nutrition

- Diets and metabolic disorders
- Functional/speciality foods
- Probotics and lactic acid bacteria
- Cereal/milk./meat/fruits and vegetables-based foods
- Micronutrients and human health
- Fermented foods and human health
- Institutional catering

Food Safety and Quality

- HACCP in food industry
- Quality characteristics of foods
- Food protectants/irradiation
- Detection systems for pathogens
- Foodborne pathogens

Global Marketing of Foods

- Marketing strategies of exports
- Agro-foods of developing countries
- Cold chain for success of marketing
- Potentialities of traditional foods

Eco-Friendly Environment

- Management of food wastes
- Food industries & environment
- Status in developing countries

Biotechnology

- Plant tissue cultures
- Food colours/flavours
- Microbial/meat/plant fermentations
- Value added products
- Transgenic plant/animal products
- Increase/improvements in food items

Food Packaging

- Active packages for shelf-life
- Aseptic packages
- Metal/thermo containers
- Biodegradable packages (eco- friendly)
- MAP of fresh produce

Food Processing and Engineering

- Automation in unit operations
- Newer technologies
- Membrance applications
- Super critical fluid extraction systems
- Energy management

IPR and Patents

- Global scenario
- Impact on food commodities
- Implications in developing countries

Traditional Foods for Globalisation

- Globalisation of traditional foods
- Commercialisation of Indian foods
- Quality and sensory characteristics
- Tropical fermented foods
- Plant and animal foods

Food Laws

- Certified reference materials
- Validated analytical techniques
- International and national trade
- Quality systems and regulatory use
- Food standards of quality and safety

Policy Issues for Global Success

- Food security in developing countries
- World food scenario and priorities
- Food industries in developing countries
- Policies and strategies for food industries
- Plant genetics in food security

Human Resource Development

- Management of food industries
- Management for global success
- Curricula for global impact

How to Reach Mysore

Mysore is easily accessible from New Delhi, Mumbai, Calcutta and Chennai via Bangalore by either rail, road or air. Mysore is just 140 kms off Bangalore and can be reached by rail or road from Bangalore in two and half to three hours.

Technology Showcase of Value-Added Foods

IFCON-98 is coupled with an exhibition, FOOD EXPO-98, which is being organised during the same period in association with the Confederation of Indian Industries (CII), Mysore Zone.

Major sectors covered by FOOD EXPO-98 are dairy, products based on vegetables, fruits, meat, marine, fish, poultry and cereals, alcoholic and non-alcoholic beverages, packed drinks, ice-creams, confectionery, coffee/tea processing and ready-to-serve foods.

Bringing Business and Ideas Together

The main theme will focus on the technological aspects of food processing, packaging and also on value added foods. This will give an opportunity for the leading competitors around the globe to come together and interact with each other with useful discussions on technological upgrading and innovation for success in the competitive international market.

It is hoped that FOOD EXPO - '98 will be a rewarding experience to the entrepreneurs and captains of industry who display their machinery, equipment and value added food products and this will add new dimensions to the food industry sector in achieving the ultimate objective of serving humanity through healthier novel food.

Launch Pad

Companies interested in launching their products during this international event, can make use of "LAUNCH PAD" for optimum mileage. Launch Pad facilitates the users with exclusive advertisements in newspapers, hoardings, laser shows, light music and a separate platform at the venue to demonstrate the products and interact with visitors to the exhibition. The Launch Pad will be complementary to the principal sponsor of IFCON - '98.

FOOD EXPO-98 *Exhibitor Profile*

- Manufacturers and suppliers of
  i) Food processing equipment
  ii) Packaging systems
  iii) Refrigeration technology
  iv) quality and hygiene systems
  v) Storage and handling systems
- Exporters of food products
- Research and consultancy organisations
- Specialised transportation systems
- Marketing organisations
- Financial institutions

Address for Correspondence

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Association of Food Scientists and
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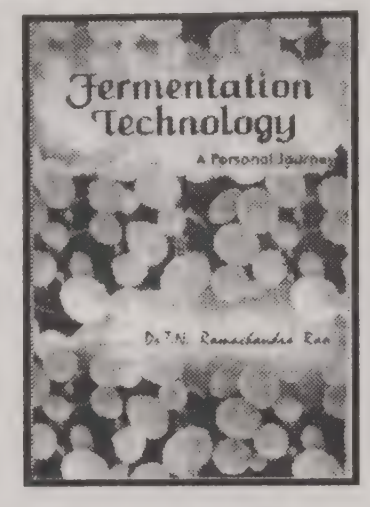
BOOKS

Saket Food Processing Hand Book

Editors Jay Narayan Vyas and Gitesh Shah; Published by Saket Projects Ltd., Saket House, Panchsheel, Usmanpura, Ahmedabad - 380 013, India. Ph: 7551931, 7551817, 7550452; Fax (079) 7550210; Telex 0121 6343. E-mail : Saket@adl.vsnl.net.in Price Rs. 750, US $ 40; pp 352.

The Saket Food Processing Hand Book is a timely compendium of very useful data on a variety of food products, Indian *vis a vis* the world. Among the commodities covered, the data on fruits and vegetables pertain mainly to area of production and productivity as yield per hectare during the period 1991-1994. The data on marine and meat products, milk and milk products, foodgrains and other agro products, spices, coffee, tea, oil, sugar and confectionery, deal with growth total and for export, future projection and potentials, from estimates of investments etc. The volume has fifteen major sections, of which the last four sections provide the related useful information on the list of food processing consultants, part list of Governmental Industry and Sectoral Agencies and some important Research and Development Schemes from APEDA. The spate of articles from eminent personalities, in our view is the best part of the Hand Book that offers advice, practical hints and common wisdom to succeed in the setting up and running of Food Processing Industry.

Copies are available at M/s Granth Vitaran, 101, Shreyas, Opp. Jain Temple, Near Navarangpura Bus Stop, Ahmedabad 380 009. Ph: 6425978; Fax (079) 7550452. **R.J.**



Fermentation Technology

A Personal Journey

Editor Dr. T. N. Ramachandra Rao; Published by Karnataka State Council for Science and Technology, Indian Institue of Science, Bangalore 560 012, India (1996) pp. 155 + XI.

The revelations made in this volume are truly stunning. Did we, in India, really reach such heights in Fermentation Technology more than fifty years ago ? Dr. T. N. Ramachandra Rao provides authentic information that a patent was granted to CSIR on a "Process for Production of Distillery Yeast of High Potency" and the claims were successfully demonstrated with 12-13% alcohol obtainable (with 82-85% fermentation efficiency) as against 6-7% usually obtained in Industry. Factory scale trials were carried out at M/s. Oudh Sugar Mills at Hargaon with 11.5% (by volume) alcohol obtained. Equally impressive are success stories of the microbial production of citric acid (1943), lactic acid (1944), acetone and butanol, acetic acid (1917), Baker's yeast, fungal and bacterial amylases and proteinases, using such inexpensive raw materials as cane sugar, molasses, wheat bran, rice bran etc. Pioneering work has also been carried out on production of antibiotics and microbiological formation of sulphur, all in and around 1940s. The author of this compact volume, himself, a microbiologist par excellence has been responsible for the successful execution of several of the above referred projects and thus is able to carry us through a journey into the hoary past that provides us with the awe-inspiring and authentic scenario of the early developments in Indian contribution to Industrial microbiology. Many of the developed microbial cultures may have languished without commercial exploitation and proper storage to sustain viability over a period of half a century or more. However, these early developments did form the basis and provide inspiration for work being continued even today in several of the National Laboratories, Academic Institutions and even in Industry.

We have with us, modern instrumental and analytical facilities and reaction vessels with sophisticated programmable controls which provide us with unprecedented advantage for optimization, strain improvement, product recovery that should provide unprecendented economic advantages. The contributions of the early Indian Fermentation Technology have truly been the healthy and magical seeds that have sprouted into some of the fruitful benefits witnessed today.

Dr. Ramachandra Rao's narration is fascinating, Hardcore scientific reporting, that it is also punctuated with interesting historical accounts and episodes. This is possibly the first and the only one treatise on history of Fermentation Technology in India.

For copies please write to Shri Ram Prasad, Exec. Secretary, Karnataka State Council for Science and Technology, Indian Institute of Science Campus, Bangalore- 560 012. **R.J.**

JFST
CONTENTS

JOURNAL OF FOOD SCIENCE AND TECHNOLOGY

Volume 35 **Number 5** **September-October 1998**

IFCON '98 AND FOOD EXPO '98

November, 24-27, 1998 at Mysore

The second circular giving the full operational details of IFCON '98 and FOOD EXPO '98 has already been sent out to all the members of the Association. It is heartening to note that there has been on overwhelming response from Scientists through abstracts of their research papers for posters presentation and technical sessions. The response to participate in technology show cause of value-added foods (EXPO'98) is equally encouraging. The stalls earmarked for the show are fast filling up with entrepreneurs responding in a big way. The organisers of this mega event are looking forward to meet all the participants, both Indian and overseas and get the benefit of interacting with them.

It is hoped that participating in IFCON'98 and FOOD EXPO '98 will be a rewarding experience to all scientists, enterprenuers and captains of Industry and in turn, will add new dimensions to the food industry sector in achieving the ultimate objective of serving humanity through healthier novel food.

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